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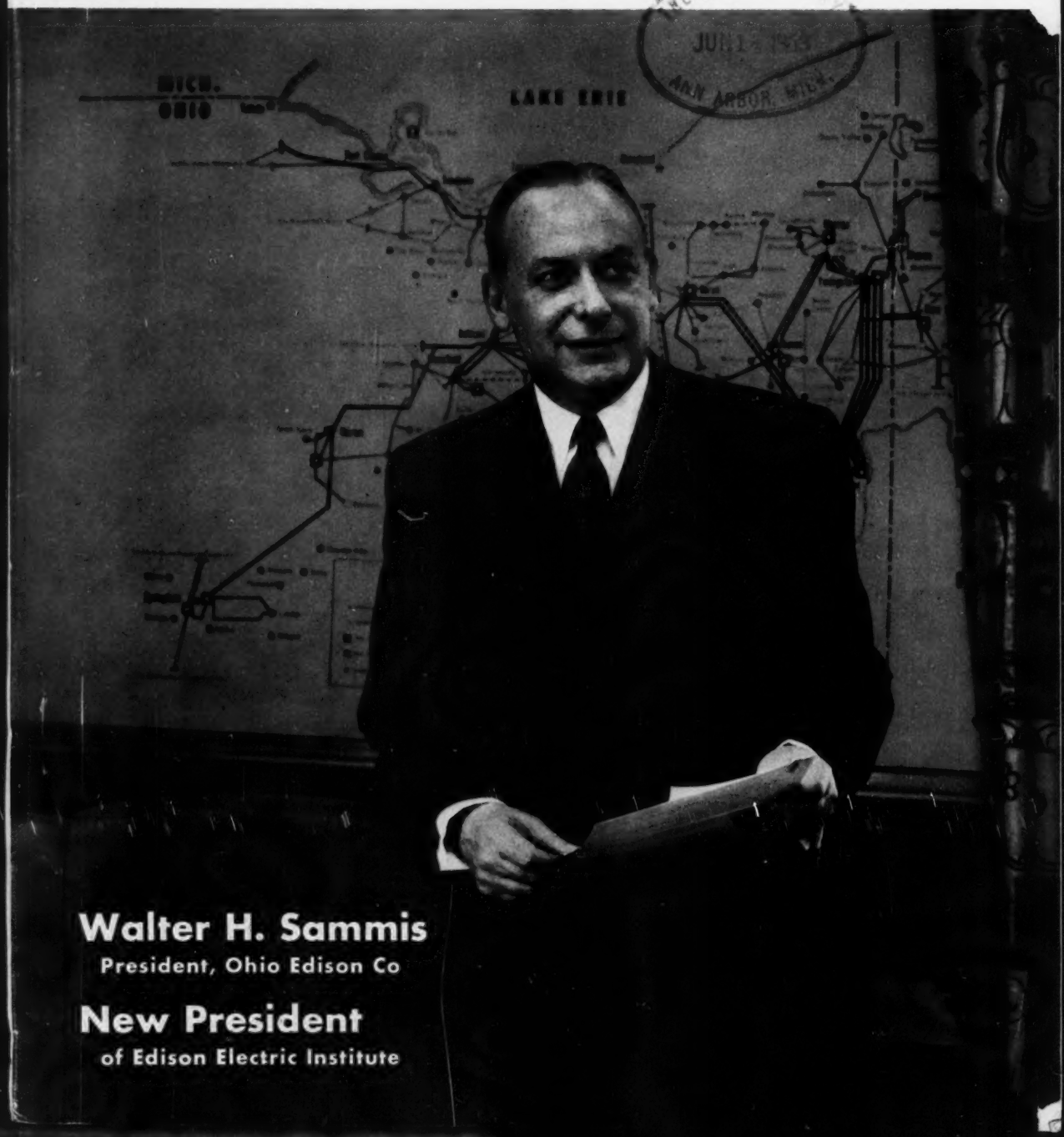

Walter H. Sammis

President, Ohio Edison Co

New President

of Edison Electric Institute

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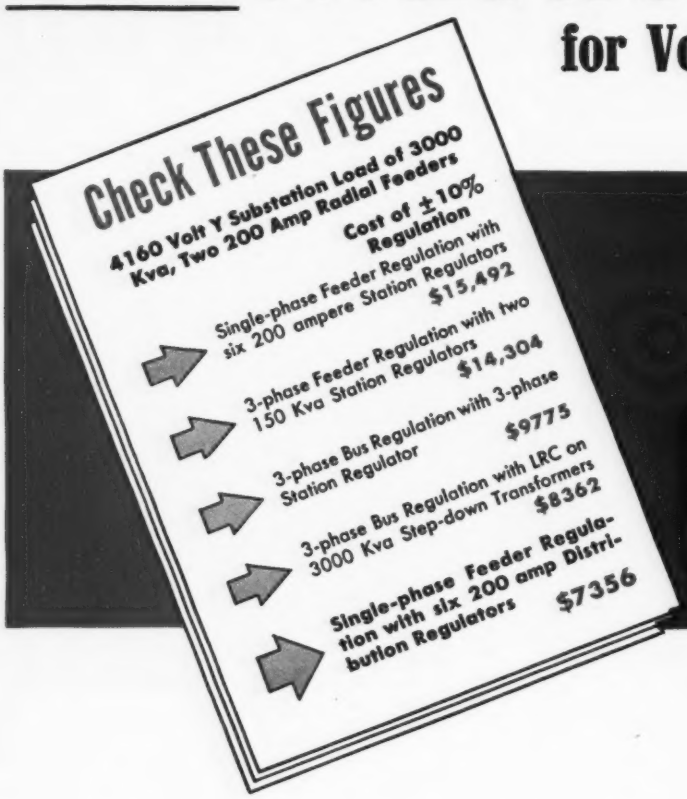
for Voltage Regulation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Cost of ±10% Regulation
Single-phase Feeder Regulation with six 200 ampere Station Regulators $15,492
3-phase Feeder Regulation with two 150 Kva Station Regulators $14,304
3-phase Bus Regulation with 3-phase Station Regulator $9775
3-phase Bus Regulation with LRC on 3000 Kva Step-down Transformers $8362
Single-phase Feeder Regulation with six 200 amp Distribution Regulators $7356

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5/8% STEP
VOLTAGE REGULATORS

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Charts Available for Cost Comparison

A set of six charts that will help analyze your voltage problems in terms of low-cost, reliable Allis-Chalmers distribution regulators is available. Call your nearby Allis-Chalmers district office or write Allis-Chalmers, Milwaukee 1, Wisconsin, for more information. A-4042

ALLIS-CHALMERS

Originators of 5/8% Step Regulation

Walt Sammis of EEI

Walter H. Sammis, new president of EEI, is widely known as the president of Ohio Edison Co. This Commonwealth & Southern subsidiary became independent on Oct. 1, 1949. By May 1 following it picked up Ohio Public Service Co, a Cities Service Co subsidiary, and a new era had begun for Ohio Edison.

Ten Years of Rapid Growth . . . From Jan. 1, 1943 until Dec. 31, 1952 the company's growth has been remarkable. Statistics (those of OPS included) show operating revenues rising from $53,620,400 to $101,382,504, utility plant from $200,256,363 to $373,864,041, customers from 410,422 to 544,143; peak loads from 597,900 to 1,214,800 kw, sales from 3.25 billion to 5.92 billion kwhr; and average residential use from 1,389 to 2,673 kwhr a year. These figures include those of Pennsylvania Power Co, a subsidiary.

Sammis the Man . . . Walt's great interest in the industry is best shown by his company's membership in all five major industry groups. His progress since he joined Consumers Power in 1920 is generally known. But here are some facts about his earlier years:

He was born June 28, 1896, in Sammis Tavern at Hempstead, L. I. This was built and operated by the Sammis family from 1660 to 1918. In all eight generations of the family were born there. As a boy Walt was a business man. He carried newspapers; raised and sold chickens, pigeons, and strawberries. He worked his way through Columbia (he is now a trustee) by tutoring and working as sight-seeing guide in New York. He served 28 months in the Navy during World War I, starting as a machinist and leaving as an ensign.

Electrical World

Published for 78 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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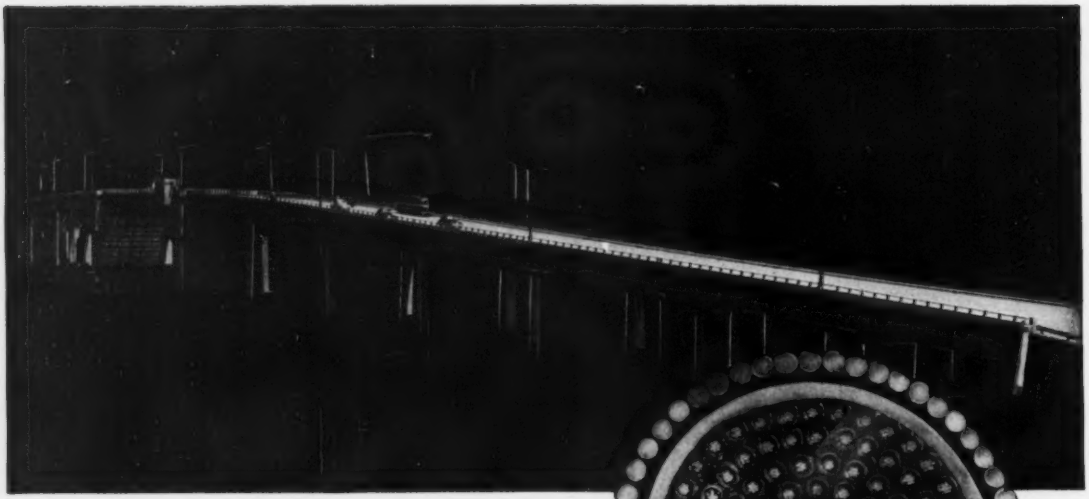

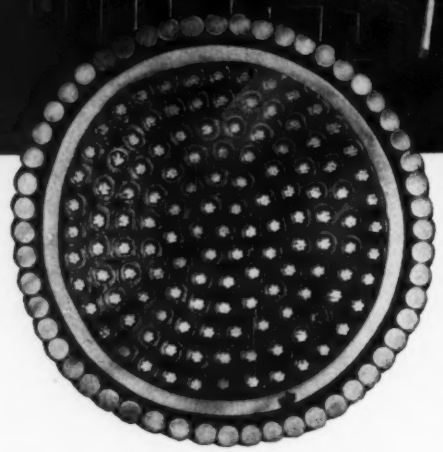

new ELIZABETH RIVER BRIDGE* features unusual OKONITE cable designs

Nearly 5 inches in diameter, this 127-conductor Okolite-Okoprene multi-purpose submarine cable contains circuits for power, control, lighting and signaling.

Just about everything but the traffic is energized through Okonite cables on the new Elizabeth River Bridge between Norfolk and Berkley, Virginia. Operating drives, brake motors, gates, pumps, lights and even electric heating units are equipped with cables designed by Okonite engineers in cooperation with J. E. Greiner Co., Consulting Engineers.

A multi-purpose submarine cable, trenched in below the river bed between the bascule piers, contains circuits for power, control, lighting and signals. This 127-conductor Okolite-Okoprene cable has a lead sheath of record diameter (4.1") and, in addition, has the further protection of a layer of jute and heavy steel armor wires.

Another unusual design is the 3-conductor Okolite-Okoprene cable for the navigation lights. This has a flexible bronze basket-weave armor to permit it to move with the fender piling and also protect it against continual salt spray.

These and other cables on this job illustrate how Okonite cables are engineered to meet the most unusual job requirements. When ordering cables for any application ask your Okonite representative to help you choose the one that is best suited for your needs. The Okonite Company, Passaic, N. J.

* Consulting Engineers: J. E. Greiner Company, Baltimore, Maryland — Contractors: Tidewater Construction Corporation, Norfolk, Virginia — Electrical Subcontractors: Tuck & Kendall, Inc., Norfolk, Virginia

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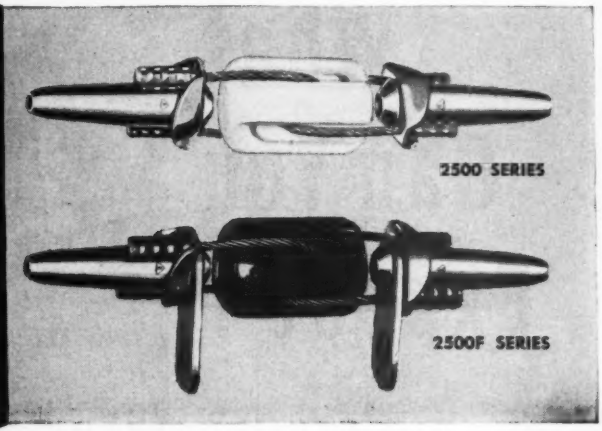
for the largest number of line applications at the lowest possible cost...

USE *Electroline* Insulating Automatic Line Splice SECTIONALIZERS



The Electroline Sectionalizers are assemblies that will function in service as most convenient, reliable and yet low cost interrupting devices. Series 2500-F and 2600 provide for paralleling with a fuse element for further protection when sectionalizing. The mechanical strength of these assemblies exceeds in all cases the rated breaking strength of the conductor for which they are adapted.

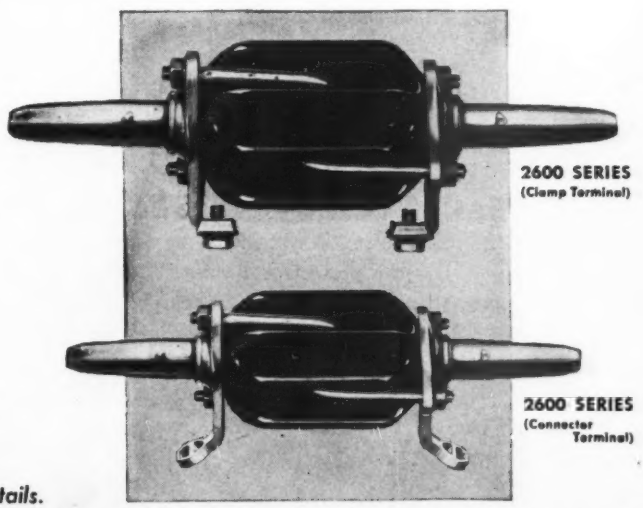
These Insulating Automatic Line Splice Sectionalizers are ideal for:

Installing Regulating Equipment,
simplifies cutting-in disconnecting points, fuses, voltage regulators and series capacitors;

Restoring Service,
providing points to test for trouble;

Sectionalizing Networks,
to readily isolate and test the area in trouble;

Series Street Lighting,
simplifies cutting-in series street lamps—merely cut the line and insert conductor ends into sectionalizer.



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S&C POWER FUSES have all these characteristics. Their lifelong accuracy permits systems to be planned with close multistep coordination between protective devices . . . brings a **NEW ERA** of system protection . . . **NEW THINKING** about how fuses can be used to better advantage, and **NEW CONCEPTS** of the place for fuses in protecting lines and equipment.

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The days when baling wire and a fibre tube made an acceptable fuse passed more than a generation ago . . . although many such fuses are still on the market!

Engineering techniques reflected in S&C Power Fuses mean accuracy and dependability equal or superior to the best-engineered protective devices of other types. Would you like to know more? Write for detailed information.

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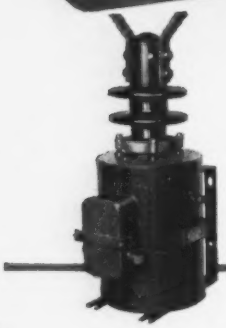
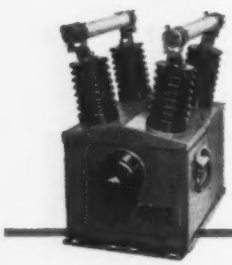
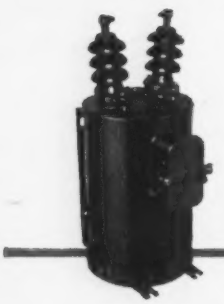
INSTRUMENT TRANSFORMERS



All Allis-Chalmers instrument transformers are designed to meet ASA standards. At left: Outdoor current transformer, Type KO, rated up to 15 kv, 800 amp.



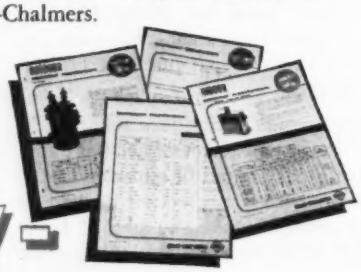
Thousands of these units are now in use with excellent operating records. At left: Indoor potential transformer, Type PD, fused or unfused, rated up to 14,400 volts.



All transformers are liberally designed for long service — built for easy mounting. At left: Outdoor potential transformer, Type PWD, rated up to 14,400 volts.

VIRTUALLY *every* instrument transformer requirement can be met from Allis-Chalmers 400 ratings of current or potential transformers or metering outfits. You can select dry-type, oil- or compound-filled units, depending on transformer rating, application, and location outdoors or indoors.

Every unit has the best combination of engineering and materials that 50 years of experience can provide. For top quality, wide selection, and quick delivery, it pays to specify Allis-Chalmers.



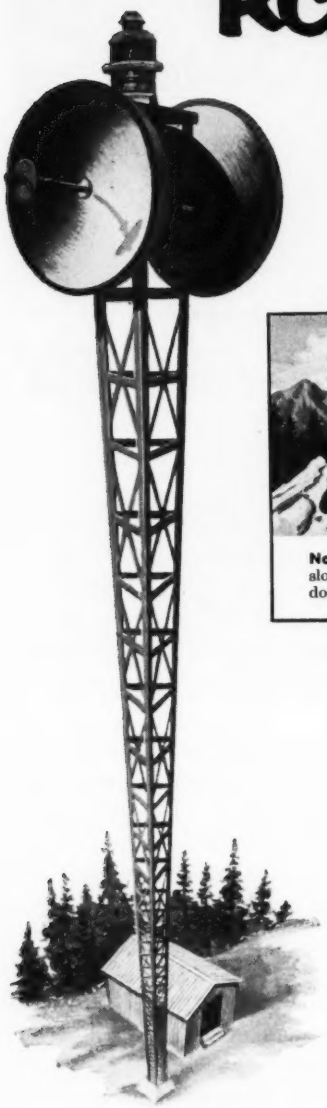
NEW-

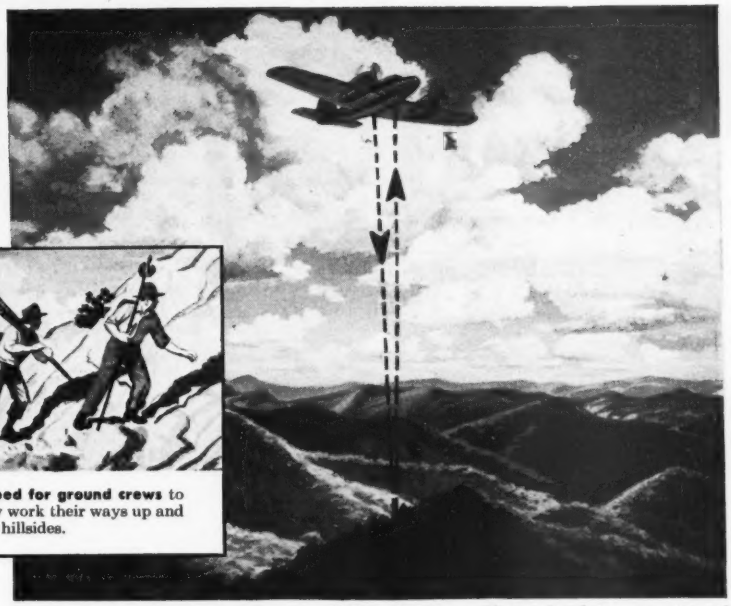
Dimension Sheets Give Complete Details

Just off the press: all the mechanical and electrical information you need in a convenient, complete bound set of data sheets. Gives more detailed presentation of Allis-Chalmers complete line of standard instrument transformers than ever before. For your copy, contact your nearby Allis-Chalmers district office or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4065

ALLIS-CHALMERS

RCA MICROWAVE





No need for ground crews to slowly work their ways up and down hillsides.

Radar signals provide precise data on contour of earth beneath proposed path of a microwave beam.

RCA AERIAL SURVEY
speeds installation ... insures accuracy

For the ultimate in microwave planning, RCA offers the important advantages of fast, accurate aerial survey.

Flying a simulated path of the microwave beam, ground elevations are charted by continuous readings from a vertical radar system. Recording instrumentation enables the survey team to plot an accurate route—and an *alternate route*—at high speed. By direct observation and aerial photography these experts select the most economical, easily accessible sites. An unobstructed microwave route is plotted in a fraction of the time normally required—without the premature publicity that often results from surveyors' operations.

For dependable communication, proved on existing systems, call an RCA Microwave Specialist at the nearest Regional Office, or MAIL COUPON.

• • •

Check RCA 2-way radio for proved dependability in mobile communications.

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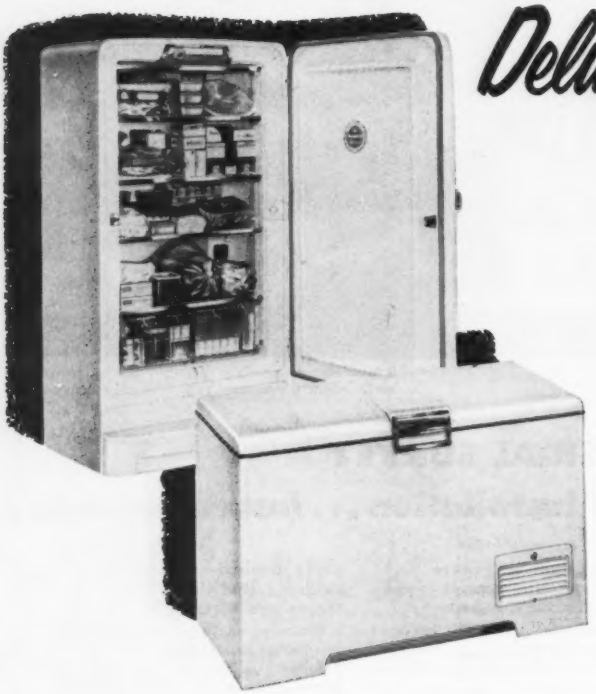
This Important Revenue Builder is Setting Growth Records...

Hotpoint

Deluxe Food Freezers



With the number of home food freezers on electric utility meters almost doubled during the past two years, and the saturation up 60% in that time, the Hotpoint Deluxe Food Freezer is an appliance that warrants the serious attention of all electric utility companies.

Here is an appliance that works for you 24 hours a day . . . not just at peak periods. In very few instances are trade-ins necessary. The demand for freezers is relatively uniform in all sections of the country . . . throughout the year . . . no peaks and valleys. It's the appliance most homemakers intend to buy next.

The same outstanding engineering skill that goes into all Hotpoint Appliances is incorporated in the Hotpoint Deluxe Food Freezer. The same Hotpoint tradition of unquestioned quality sets the Hotpoint Freezer apart in the Freezer industry. Hotpoint Food Freezers are available in all popular sizes in the chest-type models and in the new 10.5 cubic foot upright model. All models provide features that guarantee maximun efficiency, convenience, durability, and dependability. Have the Hotpoint distributor show you why it will pay you to put your support behind Hotpoint Food Freezers for added revenue . . . today and tomorrow.

Again Hotpoint looks at Tomorrow, Today

HOTPOINT Co. *(A Division of General Electric Company)* **5600 West Taylor Street, Chicago 44, Illinois**

x = Manufacturer's Tests

$f(x,y,z)$ = Protective Performance

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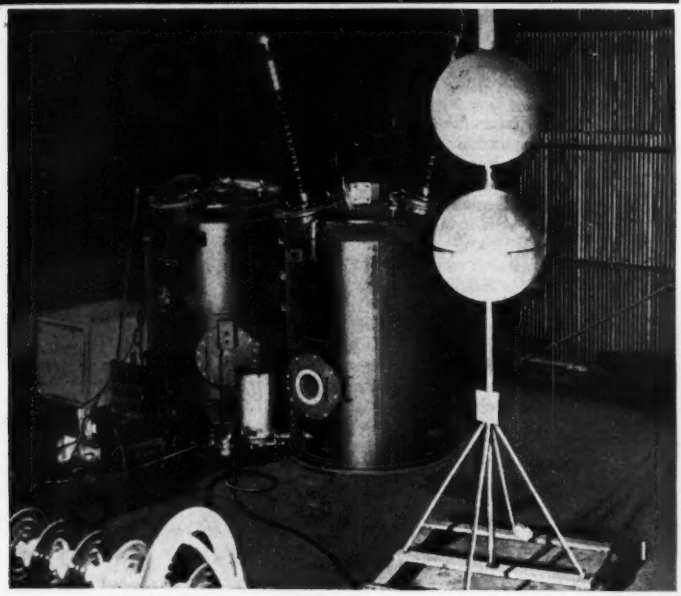
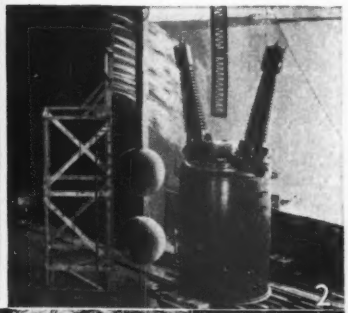
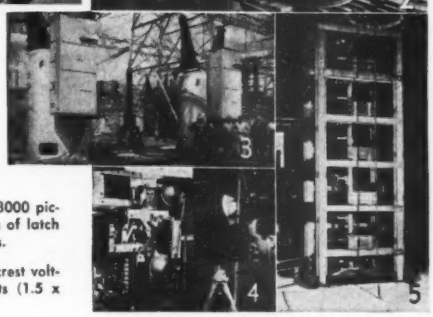
OIL CIRCUIT BREAKERS

embody the "X" factor to a high degree







PACIFIC'S TEST PROGRAM IN ACTION

is partially shown by these views

1. Pole Unit of 161-kv, 10,000,000 kva, Type RHE withstands 365 rms kv, 60-cycle.
2. Pole Unit of 230-kv Type RHE withstands 445 rms kv, 60-cycle, under water spray of wet test.
3. An at-site setup for field test of interrupting rating, using two units at 230 kv. Interruptions to 9,600,000 kva (ASA) at 240 kv were obtained—the maximum from the generating facilities available.
4. High-speed camera, making 3000 pictures per sec, records motion of latch linkage during design studies.
5. Impulse Generator used for crest voltage tests to two-million volts (1.5 x 40-ms wave).

CIRCUIT BREAKER Performance is a function of several factors, of which the manufacturer's test program is but one. However, this "x-factor," as some call it, deserves as much attention when selecting circuit breakers as does any of the tangibles.

Pacific Electric's facilities and arrangements for testing, and their use by trained test personnel, have contributed significantly to the reputation that Pacific breakers enjoy among today's application engineers.

Design tests cover such matters as insulation withstand (60-cycle and impulse), interrupting time and current, momentary and 4-sec high currents, the continuous-current heat run, and check of mechanical features (the 5000-operation design test).

Noteworthy is Pacific's policy of field testing at locations where maximum interrupting current may be obtained at full voltage and high recovery rates. Seven such field test programs have been completed during the last five years; they avoid need of extrapolating from laboratory tests in which one or more of the elements may be missing.

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How Burndy Limiters Isolate Faulted Cables and Prevent Extensive Damage in Underground Secondary Networks

by IRVING MATTHYSSE *Chief Design Engineer, Burndy Engineering Company*

Prompt, selective clearing of severe electrical faults in underground secondary cables is of utmost importance in preventing extended loss of service to customers, the possibility of explosion and fire as well as expensive replacement and repair. Reliance on system capacity alone to burn faults clear is dangerous as it obviously gives faults greater leeway to "hang on", to spread, to cause "roasting" of cable insulation and destroy hundreds or even thousands of feet of cable before cutting crews can arrive on the scene.

It is for this reason that an ever increasing proportion of utilities are using Burndy Limiters in their secondary systems. These limiters are expressly designed to clear short circuit currents quickly, although the time-current characteristics of the device are such that normal electrical overloads—which will not harm the insulation of the cable—can be carried for long periods of time.

The Burndy Limiter basically is a combination fuse and cable connector, rated in terms of voltage and cable size, according to the cable which it is designed to protect. (Time-current characteristic curves are shown on opposite page).

Let us see how the Limiter functions under typical fault conditions:

Referring to Fig. 1, we see a typical AC secondary network system with one of the 3 phases shown. For clarity, this has been somewhat simplified. It is apparent that a network is essentially a grid (in practice often conforming to the pattern of the city's streets) inter-connected at all junctions. Power is fed into certain junctions of the secondary mains (usually 220 volts) by means of transformers which convert the voltages from incoming primaries or high voltage feeders (usually 4,160 volts or higher). Limiters are shown at junction B.

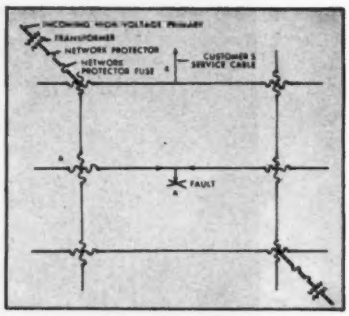


Fig. 1—Typical AC Secondary Network

Assume that the fault occurs at point A, Fig. 1. Current is supplied to the fault via junction B through the Limiter in the faulted cable. The fault current at junction B is divided among the other 3 Limiters, and it follows that the Limiter in

UNDER

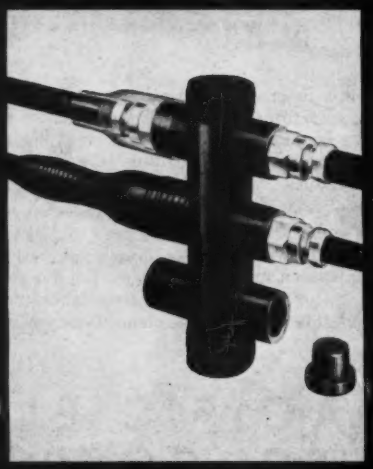
FOR SOUND,
QUICK CONNECTIONS
...ECONOMICAL EXPANSION

Burndy Moles have multiple outlets, from 2 to 18 per unit, permitting reserves for future use. Each outlet will take a range of cable sizes. Easy interconnection of Moles permits great flexibility of expansion.

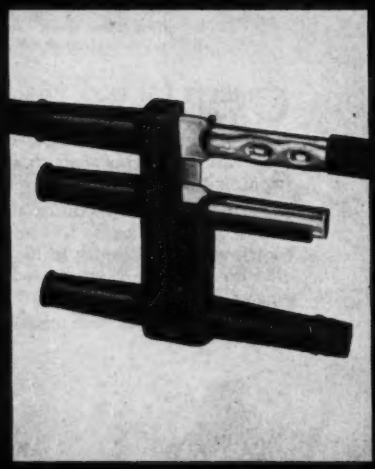
Burndy Hycrabs are multiple connectors providing permanent compression joints. Four to twelve outlets per unit. Completely insulated, Hycrabs are compact and lightweight. Cables quickly, easily installed with Burndy Hypresses.

For coordinated cable protection, a variety of Burndy Limiters is available to isolate and localize cable faults. Limiters may be used with Moles, Hycrabs, or on ring bus

Call your Burndy representative for details or write for Underground Catalog Z47.



Installed Burndy Mole showing socket and nut method of connection. Plugs, like the one shown, protect unused outlets until needed for expansion.



Cutaway picture of Burndy Hycrab. Note heavy molded rubber insulation and simple indent method of installation.

the faulted cable will blow. A similar action occurs in the other end of the faulted cable. Acting in this way, Limiters isolate the faulted cable from the network without disturbing the rest of the network. The source of the trouble can be quickly located, easily repaired. Explosions due to overheated insulation, and spread of damage, are prevented.

Coordination of Limiter and Cable Insulation Damage Curve

Since the basic function of the Limiter is to protect the cable which is faulted, *the Limiter must blow before the insulation reaches the roasting point.* Hence, a properly designed Limiter must coordinate with the insulation damage characteristic of the cable.

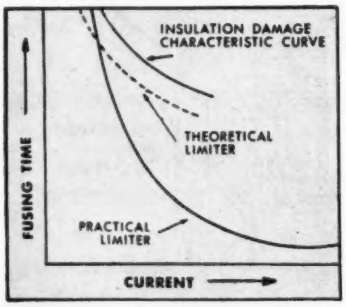


Fig. 2—Typical Insulation Damage Curve

Fig. 2 is a typical insulation damage curve of time plotted against current (seconds vs. amperes) showing the insulation damage characteristic curve for a specific size of cable. In addition, the ideal Limiter curve and the practical Limiter curve are shown. The ultimate Limiter is simple, rugged enough to withstand normal operating conditions during the life of the cable, and practical to manufacture.

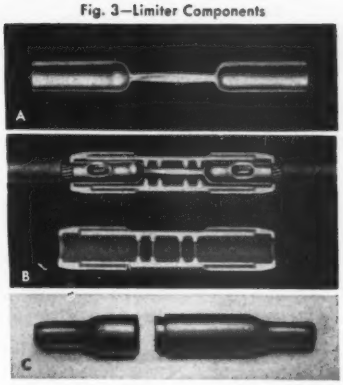
Since Limiters are also electrical connectors, they take many forms. In all cases, these Limiters are secured to the cables by means of a mechanical or a compression type connection. No solder is used, because, at the operating temperatures required of Limiters, solder would melt and therefore prevent proper Limiter operation.

Limiters must coordinate with the cable, coordinate with each other, coordinate with Network Protector Fuses. Through engineered design and accurate fabrication, Burndy maintains the integrity and quality of this product, and makes Limiters one of the most valuable assets in the operation of modern AC secondary networks.

All component parts of a Limiter Assembly are shown in Fig. 3.

Fig. 3A shows the Limiter itself. This connector has been fabricated from a single length of copper tubing and is hot-tin dipped. It is composed of two sockets

Fig. 3—Limiter Components



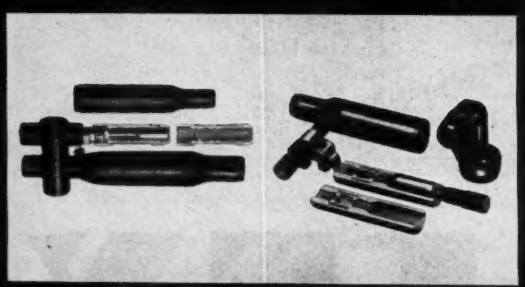
joined by a fusible section which has been flattened and is accurately formed to provide proper fusing characteristics. Fig. 3B shows the cables installed at each end by indenting with a Burndy Hypress. The heat resistant shell incorporates barriers which quench the arc rapidly. Fig. 3C shows the insulating sleeve which is used over the entire assembly and sealed by taping.

In particular, note the shape of the fusible section. The reduced section at either end enables the Limiter to have a characteristic curve more nearly approaching the theoretical curve by reducing the heat drain to more massive ends of the Limiter.

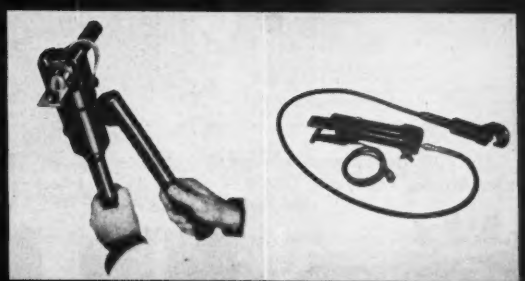
53-21

GROUND

BURNDY MOLE LINE EQUIPMENT



Burndy Limiters. Two variations are shown. At left, Molimiter installed on Mole. At right, exploded view of Limiter Ton before compression—a ring bus connector which also provides overload protection.

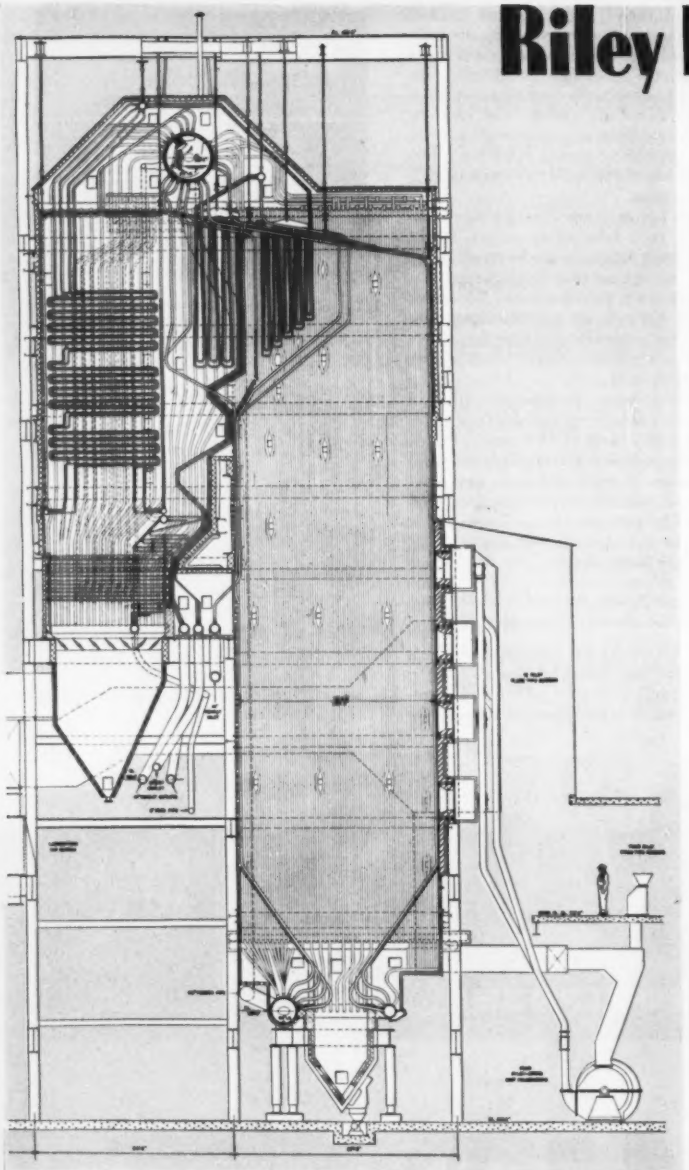


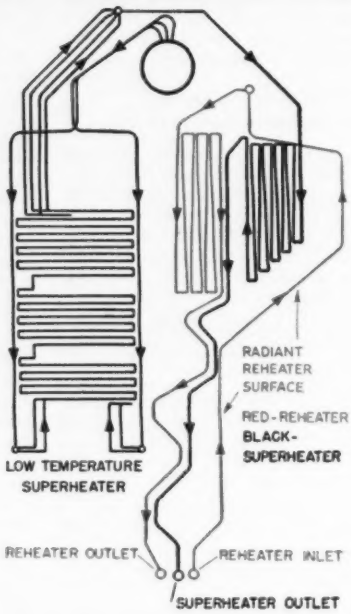
Manual Hypress, weighing 9 lbs., delivers 9 ton crimping force. Neoprene covered. Rotating head 90°. Foot operated. Hypress handles cable through 2,000 Mcm with pressures to 80,000 lbs. Swivel joints, flexible, high pressure hose permits use at any angle. Ground lead protects operator.

BURNDY

NORWALK, CONNECT. FACTORIES: New York, California, Toronto EXPORT: Philips Export Corporation TORONTO, CANADA

Riley Reheat Unit





SUPERHEATER AND REHEATER CIRCUITS

Engineering Data

Capacity, 575,000 lbs./hr.
Design Pressure, 1,700 psig.
Steam Temperature, 1,000°F.
Reheat Temperature, 1,000°F.
Furnace Volume, 53,000 cu. ft.
Temp. Furnace Exit Gas, 1,900°F.
Furnace Width, 29'3"
Furnace Depth, 23'10⅞"
Efficiency, 87.8%
Fired by 4 Riley "50" Pulverizers and 12 Riley Flare Type Burners

UTAH POWER & LIGHT CO., SALT LAKE CITY, UTAH
575,000 lbs./hr. — 1700 psig, 1000°F. — 525,000 lbs./hr. reheat — 396 psig, 1000°F.
Bechtel Corp., Engineers.

TRADE MARK Rx REGISTERED

RILEY

STOKER CORPORATION, WORCESTER, MASS.

Boston New York Philadelphia Washington Buffalo Pittsburgh Cleveland Detroit Chicago
Cincinnati Charlotte Atlanta New Orleans St. Louis Kansas City St. Paul Tulsa Houston
Denver Salt Lake City Los Angeles Portland Seattle

BOILERS • PULVERIZERS • BURNERS • STOKERS • SUPERHEATERS • ECONOMIZERS

at Utah Power Giving Outstanding Results

The Riley Reheat Unit at Gadsby Station of Utah Power and Light Company went on the line in November and has been giving entirely satisfactory performance since that time.

Operation has proven the advantages and desirability of the radiant section of the reheater, which permits operation at sufficiently low furnace exit temperatures to prevent objectionable furnace slagging and provides a relatively flat reheat temperature curve. No difficulty was experienced with rapid start-up because of this design feature.

The Riley unit is operating with air heater exit gas temperatures approximately 40 degrees lower than guarantees, resulting in appreciably higher than guaranteed efficiencies. Draft losses are also materially lower than guaranteed, providing an additional operating saving.

Here is another case where Riley provided many plus values and gave the purchaser more than his money's worth. Proof that it is profitable to rely on Riley. It will possibly pay you to investigate Riley equipment when considering steam generating or fuel burning equipment.

Twilight view of Riley Units 1 and 2, Utah Power & Light Co., Gadsby Station

A Few Riley Public Utility Sales

TEXAS ELECTRIC SERVICE COMPANY
1,250,000 lbs. /hr., 2125 psig, 1000°F. and 1000°F. Reheat—Pressurized Furnace
Ebasco Services, Inc., Engineers

DALLAS POWER & LIGHT CO.
1,250,000 lbs. /hr., 2125 psig, 1000°F. and 1000°F. Reheat—Pressurized Furnace
Ebasco Services, Inc., Engineers

HOUSTON LIGHTING & POWER CO.
1,250,000 lbs. /hr., 2125 psig, 1000°F. and 1000°F. Reheat—Pressurized Furnace
Ebasco Services, Inc., Engineers

DEPARTMENT OF WATER & POWER CITY OF LOS ANGELES, CALIFORNIA
1,200,000 lbs. /hr., 2075 psig, 1000°F. and 1000° Reheat

LOUISIANA POWER & LIGHT CO.
1,000,000 lbs. /hr., 1725 psig, 1005°F. and 1005°F. Reheat—Pressurized Furnace
Ebasco Services, Inc., Engineers

MONONGAHELA POWER COMPANY
700,000 lbs. /hr., 1050 psig, 905°F.
Sanderson & Porter, Engineers

SOUTHWESTERN GAS & ELECTRIC CO.
630,000 lbs. /hr., 1050 psig, 1005°F.
Pressurized Furnace
Sargent & Lundy, Engineers

CENTRAL ILLINOIS LIGHT CO.
600,000 lbs. /hr., 950 psig, 900°F.
Commonwealth Services, Engineers

NORTHERN STATES POWER CO.
385,000 lbs. /hr., 1500 psig, 950°F.
Pioneer Service & Engineering Co., Engineers

SOUTH CAROLINA PUBLIC SERVICE AUTHORITY
460,000 lbs. /hr., 1025 psig, 900°F.
Ford, Bacon & Davis, Engineers

THE POTOMAC EDISON CO.
700,000 lbs. /hr., 1050 psig, 905°F.
Sanderson & Porter, Engineers

IOWA ELECTRIC LIGHT & POWER CO.
300,000 lbs. /hr., 975 psig, 910°F.

SOUTH CAROLINA GAS & ELECTRIC CO.
400,000 lbs. /hr., 1475 psig, 955°F.
Gilbert Associates, Engineers

UTAH POWER & LIGHT CO.
620,000 lbs. /hr., 1500 psig, 955°F.
Bechtel Corp., Engineers

PUBLIC SERVICE CO. OF INDIANA
400,000 lbs. /hr., 1000 psig, 910°F.
Sargent & Lundy, Engineers

ARKANSAS POWER & LIGHT CO.
650,000 lbs. /hr., 1050 psig, 905°F.
Ebasco Services, Inc., Engineers

GULF POWER COMPANY
325,000 lbs. /hr., 1000 psig, 900°F.
Southern Services, Engineers

IOWA-ILLINOIS GAS & ELECTRIC CO.
250,000 lbs. /hr., 975 psig, 905°F.

OHIO EDISON CO.
225,000 lbs. /hr., 975 psig, 900°F.
Commonwealth Services, Engineers

SOUTHWESTERN PUBLIC SERVICE CO.
330,000 lbs. /hr., 1050 psig, 900°F.

MISSISSIPPI POWER CO.
230,000 lbs. /hr., 925 psig, 850°F.
Southern Services, Engineers

INTERSTATE POWER CO.
200,000 lbs. /hr., 725 psig, 910°F
Sargent & Lundy, Engineers

A survey of your Power Plant by a consulting engineer will possibly show ways of making surprisingly large savings in your power costs

COMPLETE STEAM GENERATING UNITS

. . . it will pay you to visit modern Riley Installations before purchasing Boiler or Fuel Burning Equipment

WATER-COOLED FURNACES • STEEL-CLAD INSULATED SETTINGS • AIR HEATERS

CROUSE-HINDS quality starts with the casting

Type FLB Explosion-Proof Circuit Breaker Condulet

Type ARE Plug Receptacle With Spring Door

Type GUAC Explosion-Proof Junction Condulet

Type LB Obround Condulet

1. A highly skilled patternmaker, with long years of experience in precision craftsmanship puts the finishing touches on an Obround CONDULET master pattern.

They're made right to serve you better.

Working from designs that have been carefully developed in the Engineering Dept., expert patternmakers make the master patterns. Perfect workmanship is a tradition in Crouse-Hinds Pattern Dept., where half the workers have records of from twenty-five to more than forty years of service.

Crouse-Hinds Iron Foundry is one of the largest and best equipped of its kind. It has the latest mechanical improvements to enable the skilled molders to produce the best possible castings. Most CONDULETS are made of Feraloy, Crouse-Hinds special alloy having the desirable characteristics of both cast steel and gray iron. It is strong, tough, holds its shape, is inherently corrosion resisting, homogeneous, and machines well, giving sharp, full threads.

To maintain Crouse-Hinds high standard of quality there is constant checking and testing. In the Foundry Control Laboratory, core and molding sands and oils are examined. Only the best are used. Continual temperature readings of molten Feraloy are taken, and test bars are made and tested for strength in the Mechanical Laboratory. The Chemical Laboratory makes daily analyses of the Feraloy output of the foundry.

Crouse-Hinds Non-Ferrous Foundry is equipped to turn out high quality castings of aluminum, bronze, and other metals.

When quality counts use CONDULETS. They're made right ... to serve you better ... and last longer.

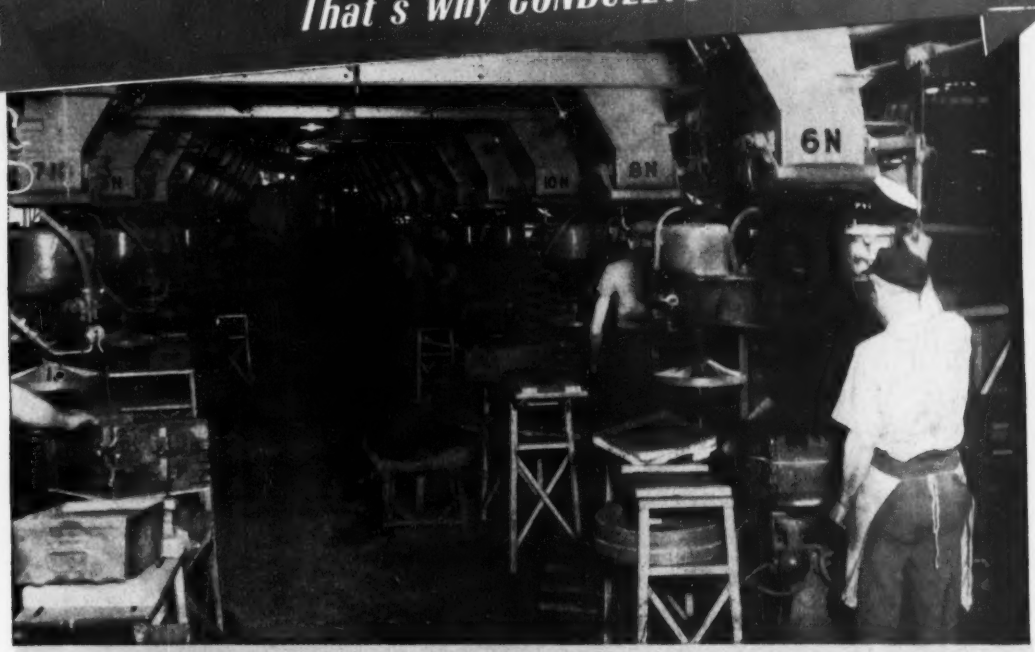
CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

OFFICES: Birmingham – Boston – Buffalo – Chicago – Cincinnati – Cleveland – Dallas – Denver – Detroit – Houston – Indianapolis – Kansas City – Los Angeles – Milwaukee – Minneapolis – New Orleans – New York – Philadelphia – Pittsburgh – Portland, Ore. – San Francisco – Seattle – St. Louis – Tulsa – Washington
REGIONAL REPRESENTATIVES: Albany – Atlanta – Baltimore – Charlotte – Corpus Christi – Richmond, Va. – Shreveport
Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

CONDULETS • TRAFFIC SIGNALS

. . . and goes thru every step

That's why CONDULETS last longer*



2. Expert molders operate the molding machines in Crouse-Hinds modern foundry. Sand hoppers are shown at top.

3. Molten Feraloy is poured into the molds from a distributing ladle in Crouse-Hinds mechanized foundry.

*CONDULET is a coined word registered in the U. S. Patent Office. It designates a product made only by the Crouse-Hinds Company.

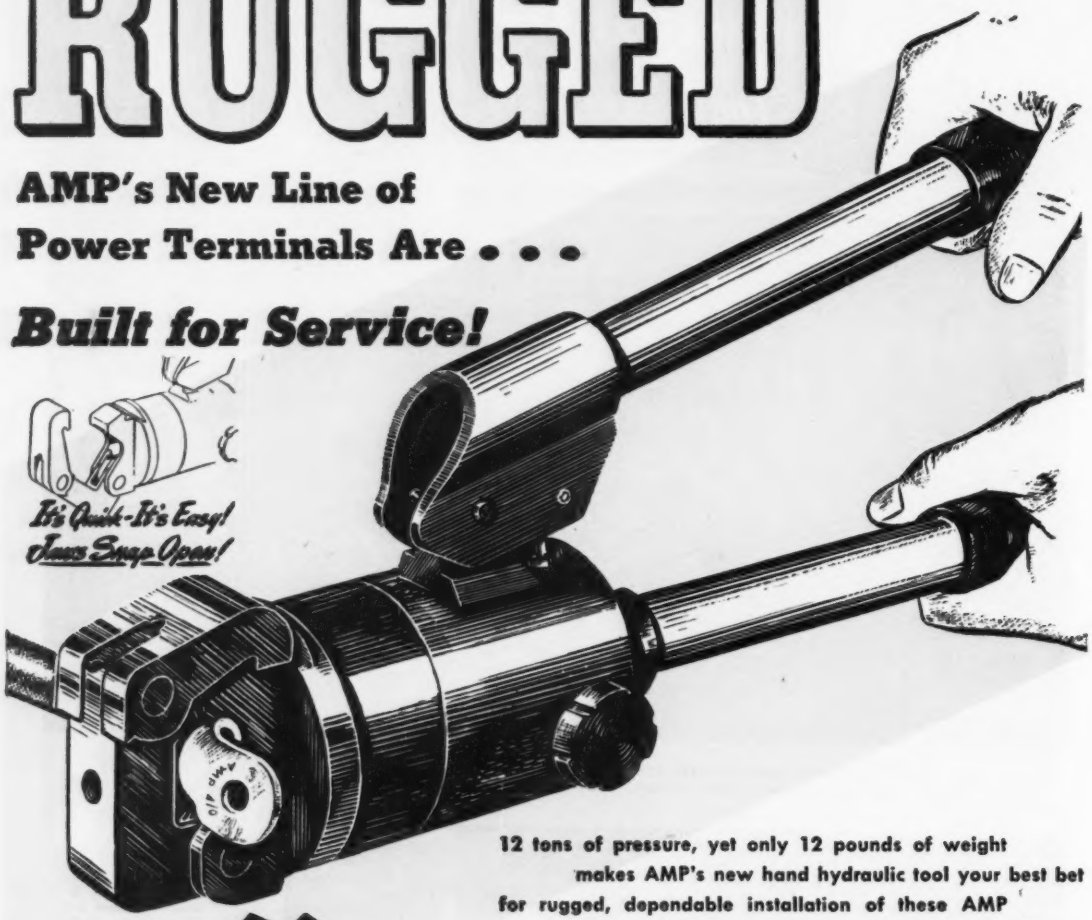
CONDULET
First in the field
STANDARD OF QUALITY
A Nationwide Distribution Through Electrical Distributors

FLOODLIGHTS • AIRPORT LIGHTING

RUGGED

AMP's New Line of Power Terminals Are . . .

Built for Service!



It's Quick-It's Easy!
Jaws Snap Open!

12 tons of pressure, yet only 12 pounds of weight makes AMP's new hand hydraulic tool your best bet for rugged, dependable installation of these AMP *precision-engineered* power terminals. Terminals and connectors are available in all ranges from #8 to #4/0. DESIGNED FOR USE ON ALL SHAPES OF WIRE: SOLID, STRANDED, SQUARE, OVAL, OR COMBINATIONS! Dies snap in and out easily. Tool automatically releases when crimping pressure is reached. Can be used with either pole strap or bench stand if desired. WRITE FOR SPECIAL POWER TERMINAL CATALOG.

AMP

AIRCRAFT-MARINE PRODUCTS INC.
POWER TERMINAL DIVISION
2100 Paxton Street, Harrisburg, Pa.

AMP Trade-Mark
Reg. U. S. Pat. Off.

Meet Al Schieber, Assistant Manager, Westinghouse Electric Utility Dept. On the next seven pages he leads a discussion on . . .

Guarding your high-cost equipment against damaging faults

A. L. Schieber has spent the last 40 years at Westinghouse helping solve utility problems. This insert covers "equipment that protects equipment" and Al has seen much of it develop from its beginnings as an idea in an engineer's mind.

"A new development promises to extend the usefulness of power line carrier in system protection. Frank Gunter of Carrier Engineering tells how . . ."

This new power line carrier equipment gives you more channels

On many systems there is a shortage of power line carrier channels for relaying, telemetering, load control, remote tripping and communication. The new FD equipment just developed packs more channels into the same frequency spectrum, gives you additional opportunities for system protection.

A combination of Westinghouse developments makes this possible. One of these is crystal control, which is used in the carrier transmitters to hold each channel exactly on frequency. Since one channel can't drift into another and create interference, the channels can be placed closer together. Spurious or harmonic outputs that are so characteristic of some electronic circuits have been reduced to a minimum in the FD equipment. This means less interference between channels—less need for space between channels—more room for additional channels. Coupled with these transmitter improvements are refinements in receiver selectivity, sensitivity and noise reduction. These receiver design changes contribute greatly to the more efficient use of the available frequency spectrum.

A very important feature of the new FD equipment is the frequency shift equipment (or assembly). The operator above is checking it with a frequency counter. Using this improved frequency shift apparatus, telemetering, supervisory control and remote tripping, each requires an r.f. bandwidth of only 120 cycles!

For additional information on how you can get more channels and more flexibility with type FD power line carrier equipment, write to Westinghouse Electric Corporation, Carrier-Microwave Section, 2519 Wilkens Avenue, Baltimore 3, Md.

YOU CAN BE **SURE**...IF IT'S

"Relays are basic to transmission protection . . . Bill Sonnemann, Manager, Relay Engineering, tells you about the latest relay developments."

Improved carrier relaying acts instantly to clear faults

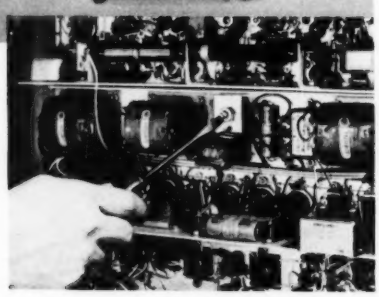
A positive way to isolate faulted sections of a transmission line is provided by HKB carrier relaying. You can't buy better protection for your high capital investment in your transmission system. This relaying system compares conditions at the terminals of a section of line. Power line carrier equipment such as shown on the opposite page enables the relays to make this comparison. When a fault occurs *within* the protected section, breakers at each end are tripped simultaneously. This is desirable from the standpoint of stability, continuity of service, quick reclosing and minimum damage to equipment.

Westinghouse HKB carrier relaying has been improved by the use of vacuum tubes to replace the thyratrons formerly used in the control unit. The vacuum tubes are continuously grid-controlled, providing surer action. An added advantage is that the vacuum tubes may be tested at any time on conventional tube-testing equipment. Since weak tubes can be detected and discarded, you can be sure at all times that the equipment will work when it is needed.

The new control unit used with the Westinghouse HKB equipment contains a new phase-shifting network. This network may be adjusted to compensate for phase shift due to an extra-long transmission line. The adjustment may be made easily in the field and it adds considerably to the flexibility of the relaying system.

These improvements in the HKB relaying system are typical of the engineering developments that make Westinghouse a leader in the relay field. For more information on HKB carrier relaying and on other relaying systems, contact your Westinghouse representative.

J-40447



A simple screw driver adjustment made in the field matches the HKB to extra-long lines.

Westinghouse

"The power circuit breaker is the key to modern system protection. Jack Stirling discusses . . ."*

De-ion interruption . . . key element in modern breaker design

Here is one of the most important developments ever made for system protection—the De-ion® grid which is standard on all Westinghouse power breakers. These breakers, being mechanically as well as electrically *trip free*, insure top-speed contact separation after reclosing as well as initially on a fault.

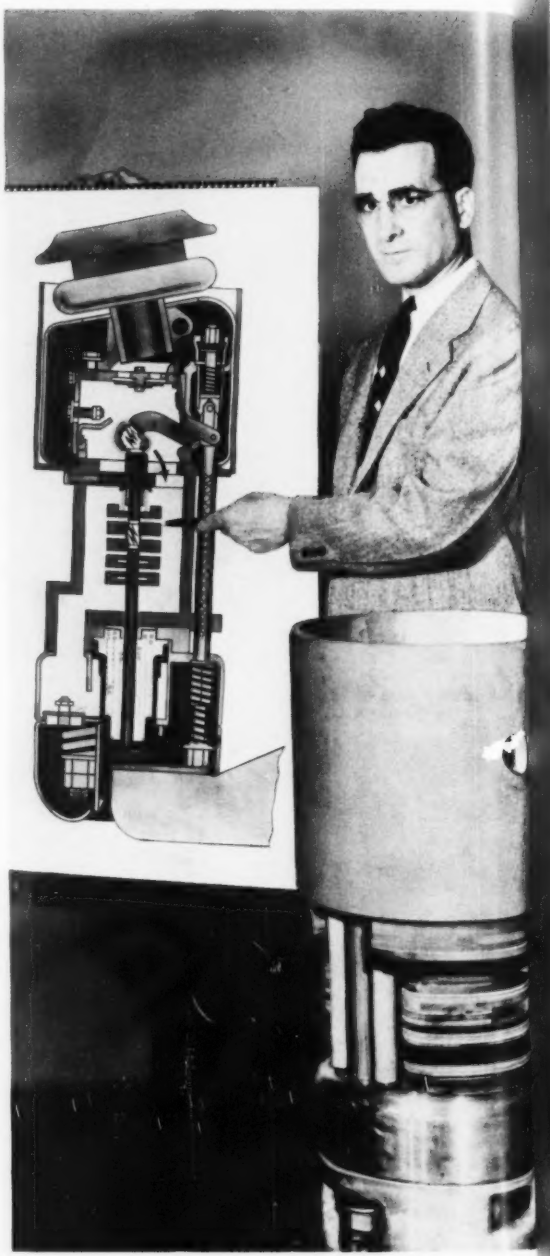
In this high-capacity, high-voltage De-ion grid, the arc literally snuffs itself out. The multi-flow principle limits arcing to one cycle, or less, and total clearing over the entire current range is *not more than three cycles.*

Even when the breaker is reclosed in 15-20 cycles, the De-ion grid has been completely scavenged of arc products making it ready for an immediate 3-cycle interruption if necessary. This high-speed isolation of faults, and high-speed reclosing ability, not only protects your equipment, but also improves your system operation.

For the past 28 years, the designers of Westinghouse breakers have had an invaluable tool—the famous High Power Laboratory. It means that every rating of breaker is thoroughly proved to give you the high level of protection you require.

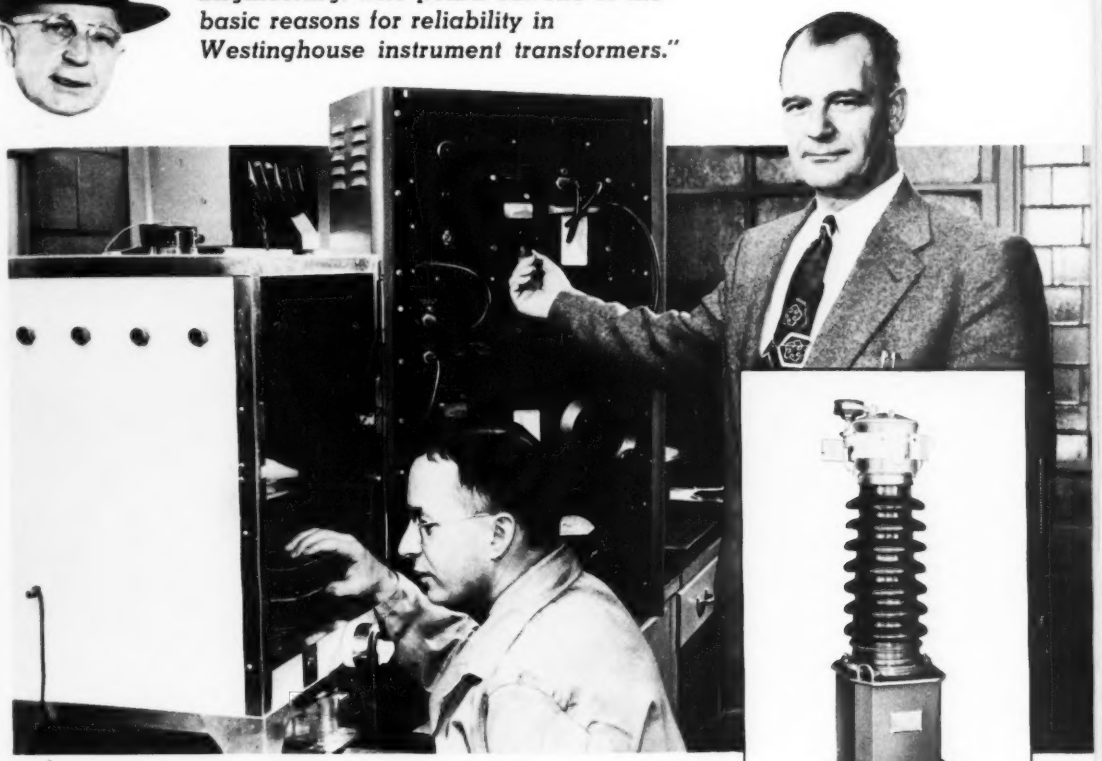
When you're planning a new breaker installation, call Westinghouse early or write now for Descriptive Data 33-160. J-60832

*Manager, Power Breaker Application Engineering



YOU CAN BE SURE...IF IT'S

"Here's Jim Ford, Manager, Manufacturing Engineering, who points out one of the basic reasons for reliability in Westinghouse instrument transformers."



Power factor control means added reliability in instrument transformers

Obviously, the larger your investment in capital equipment, the more you must be sure of reliability as well as accuracy in your instrument transformers. Here's an example of Westinghouse practice which assures vital reliability. . .

Materials having an insulating job to do—including oil, Inerteen®, pressboard, paper and similar insulating materials are given extensive quality checks including power factor.

Insulation when stressed may tend to heat up due to power-factor losses. This heating in turn increases the power factor which again increases the loss. If the power factor is controlled within permissible limits for the application, the losses can be dissipated before this destructive cycle can start . . . and, more importantly, before your equipment is affected.

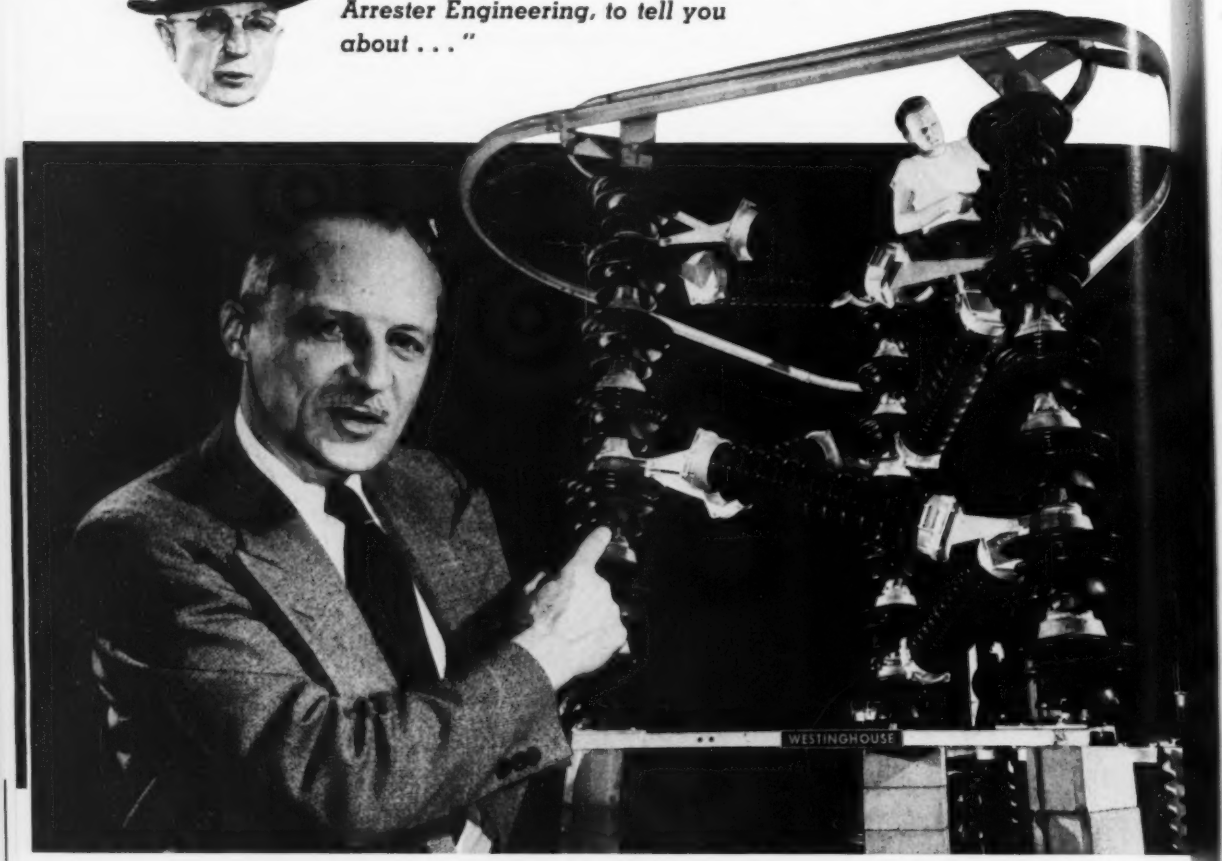
Westinghouse has steadily improved the control and application of materials used in its apparatus to assure satisfactory operation of modern Westinghouse instrument transformers.

This excellent control of the quality and use of materials, plus the superior quality of Hipersil® cores and oxygen-free copper, make Westinghouse instrument transformers the best on the market for reliability and sustained accuracy. The sealed indoor and outdoor vacuum-pressure, plastic-filled units pioneered by Westinghouse, and the sealed oil-insulated outdoor units are typical plus values for service continuity.

If you are interested in how Westinghouse instrument transformers can add to the protection of your high capital investment, call your nearby Westinghouse representative. J-70695

Westinghouse

"Here's Ed Beck, Manager of Lightning Arrester Engineering, to tell you about . . ."



Unique new tripod design . . . Better lightning protection at 230 kv and up!

With its new tripod mounting, the Westinghouse SV arrester now provides even better protection against lightning surges for systems rated 230 kv and up. The more compact design results in better voltage distribution along the arrester. This minimizes the distorting effect of the electrostatic field and maintains high surge discharge characteristics.

The more compact design also eliminates the need for supporting towers and saves installation costs. And substation designers will like the lower overall height.

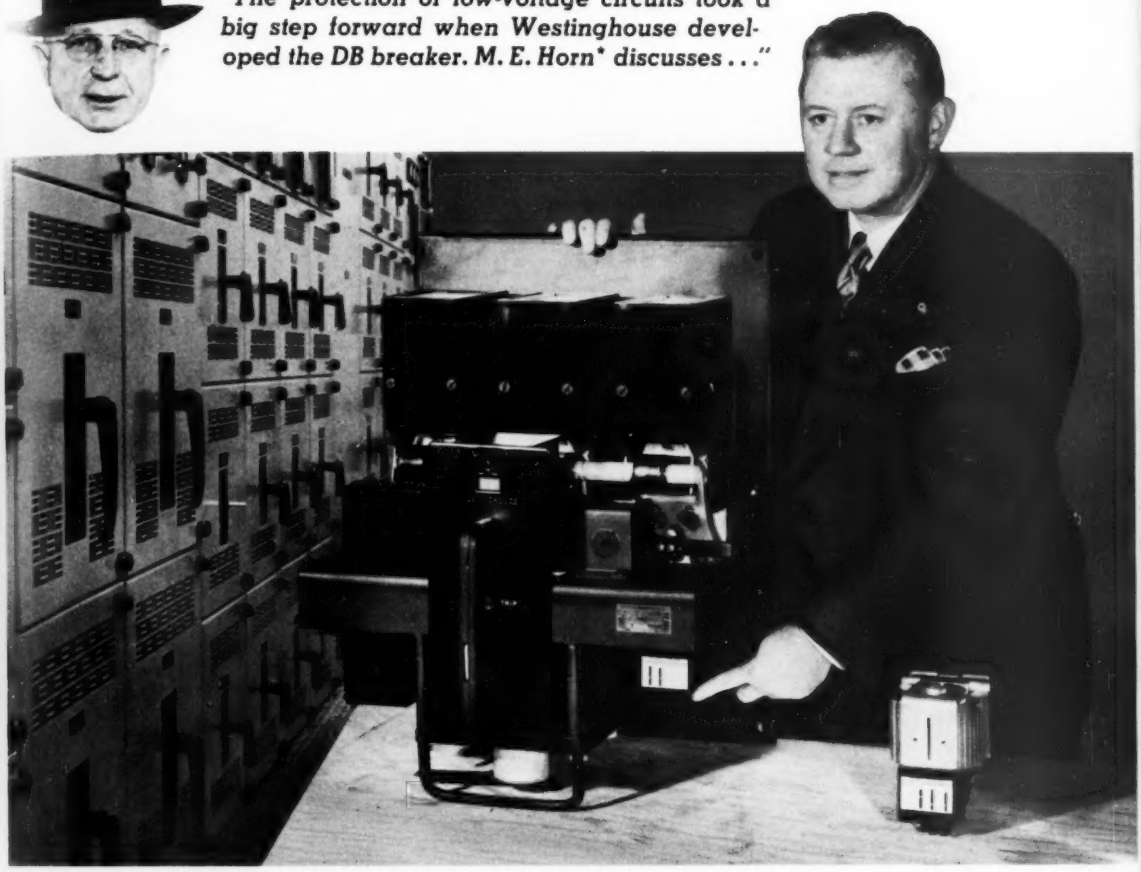
The surge capacity and characteristics of Westinghouse SV arresters exceed industry standards. No modern power transformer has *ever* been damaged by lightning when protected by an integrally-mounted SV arrester.

Westinghouse, in cooperation with many utilities, has been foremost in the study of lightning phenomena since 1926 when the Westinghouse Klydonograph made possible the original lightning studies.

Your expensive equipment deserves the high level of protection available in the SV arrester. Write for bulletin DB-38-120. J-60831

YOU CAN BE **SURE**...IF IT'S

"The protection of low-voltage circuits took a big step forward when Westinghouse developed the DB breaker. M. E. Horn discusses . . ."*



Instantaneous protection and delayed tripping . . . just the combination you need

The DB breaker contains a multi-purpose tripping mechanism which . . . (1) provides delayed tripping on temporary overloads, (2) trips on larger overloads before damage can be done, and (3) trips instantly on short circuits.

This single tripping mechanism has a wide combination of settings for delayed and instantaneous tripping. You can easily adjust it to provide the best protection and most practical operation for *your particular job.*

Here is the kind of operation this flexibility permits. You can install 50-amp breakers nearest the load and back them up with 225-amp breakers. A 600-amp breaker would supply the system. Now by proper coordination, a 50-amp breaker will trip on overload while the rest of the system keeps functioning.

DB breakers are built from highly flexible subassemblies and are designed for mounting in switchgear assemblies. Single circuit breakers are available in a variety of enclosures: such as general-purpose, weatherproof, explosion-proof, etc.

Get more information on these outstanding breakers. Write now for Booklets 4067 and 4740.

J-60830

*Manager, Low-Voltage Air Breaker Engineering

Westinghouse

"Most of the products discussed here have their roots in the exciting atmosphere of the Westinghouse Research Laboratories. Here's Dr. Clarence Zener, Associate Director."

For better system protection: Germanium 99.99999999% pure!

Here is a good example of what we call *basic* research—developing new materials and processes to improve the equipment we build. This laboratory process precipitates germanium that contains only one part impurity in ten billion!

We're using this intensely pure material in studies of "semiconductors", such as the wonderful new transistors which have such great application to relaying, microwave and other system protective devices.

Basic research accounts for about 50% of our activity. Another 40% is devoted to *fundamental* research—pure science which operates on the frontiers of human knowledge. In recent years, we have done a great deal of work in "solid state physics" which embraces semiconductors.

We expect our work to continue as a keystone in solving system protection and other utility problems. CP-1007 CP-4

For more information on the products described in this 8-page advertisement, write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

Basic research has really paid off in lightning arresters. We developed the Rutile Button which produces ionization in the spark gap at a voltage below the impulse sparkover. When lightning strikes, this *pre-ionizes* the gap. As the surge builds up——BANG!—the Westinghouse SV arrester *always* sparks over at the designed value.

YOU CAN BE **SURE**... IF IT'S

Westinghouse

Build a Better Motor...

WITH CDF

MICABOND

TAPES, SHEETS, SEGMENTS, TUBING, "V" RINGS

TO WORK WITH YOUR PRODUCTION PEOPLE our large, progressive company has special know-how on planning and producing superior mica insulation. Making exactly what you want, when you want it, is a routine part of your C-D-F Micabond purchase. If you need a new source for mica, the C-D-F Valparaiso, Indiana plant can be the answer.

TO SUPPLY YOUR PRODUCTION NEEDS C-D-F's skilled mica workers run precision machinery developed to make Micabond products uniform in their mechanical and electrical properties. A vigorous research and quality control program gives you facts and proven materials for high-heat motor applications.

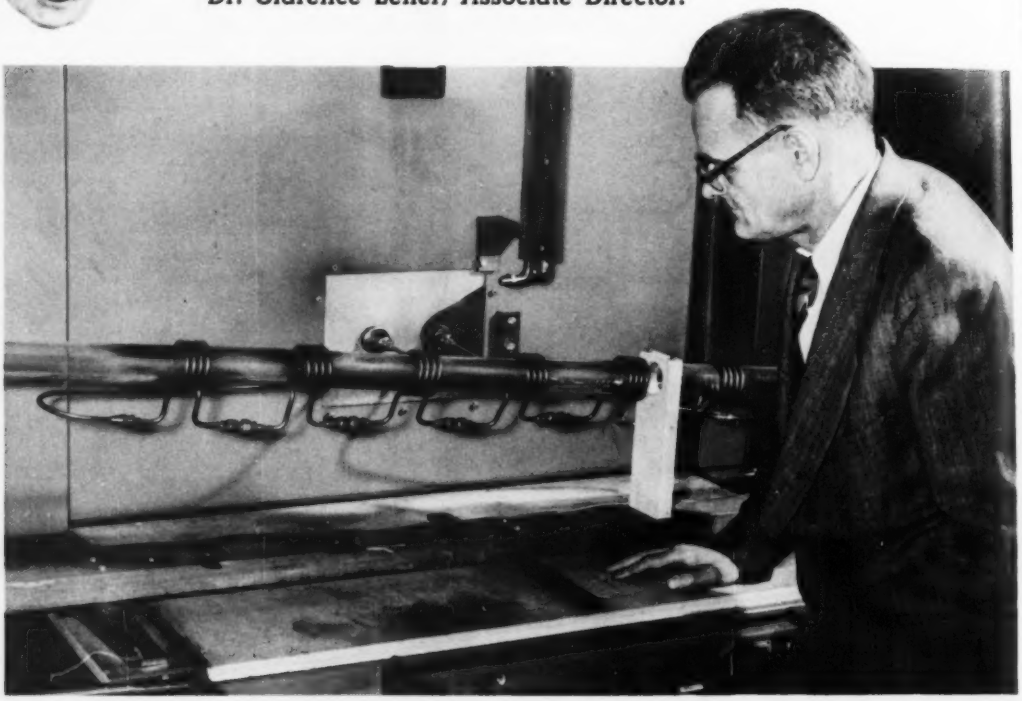
ALWAYS SPECIFY MICABOND but talk over your insulation requirements with your C-D-F sales engineer. To build a better motor, to get more insulation value, put C-D-F experience to work for you. *America's largest users of mica products rely on C-D-F.* Samples of Micabond materials, technical aid, all are yours on request.

THE NAME TO REMEMBER... CDF MICABOND

Continental-Diamond Fibre Company

NEWARK 15, DELAWARE

"Most of the products discussed here have their roots in the exciting atmosphere of the Westinghouse Research Laboratories. Here's Dr. Clarence Zener, Associate Director."



For better system protection: Germanium 99.99999999% pure!

Here is a good example of what we call *basic* research—developing new materials and processes to improve the equipment we build. This laboratory process precipitates germanium that contains only one part impurity in ten billion!

We're using this intensely pure material in studies of "semiconductors", such as the wonderful new transistors which have such great application to relaying, microwave and other system protective devices.

Basic research accounts for about 50% of our activity. Another 40% is devoted to *fundamental* research—pure science which operates on the frontiers of human knowledge. In recent years, we have done a great deal of work in "solid state physics" which embraces semiconductors.

We expect our work to continue as a keystone in solving system protection and other utility problems. CP-1007 CP-4

For more information on the products described in this 8-page advertisement, write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

Basic research has really paid off in lightning arresters. We developed the Rutile Button which produces ionization in the spark gap at a voltage below the impulse sparkover. When lightning strikes, this *pre-ionizes* the gap. As the surge builds up——BANG!—the Westinghouse SV arrester *always* sparks over at the designed value.

YOU CAN BE SURE... IF IT'S

Westinghouse

Build a Better Motor...

WITH CDF

MICABOND

TAPES, SHEETS, SEGMENTS, TUBING, "V" RINGS

TO WORK WITH YOUR PRODUCTION PEOPLE our large, progressive company has special know-how on planning and producing superior mica insulation. Making exactly what you want, when you want it, is a routine part of your C-D-F Micabond purchase. If you need a new source for mica, the C-D-F Valparaiso, Indiana plant can be the answer.

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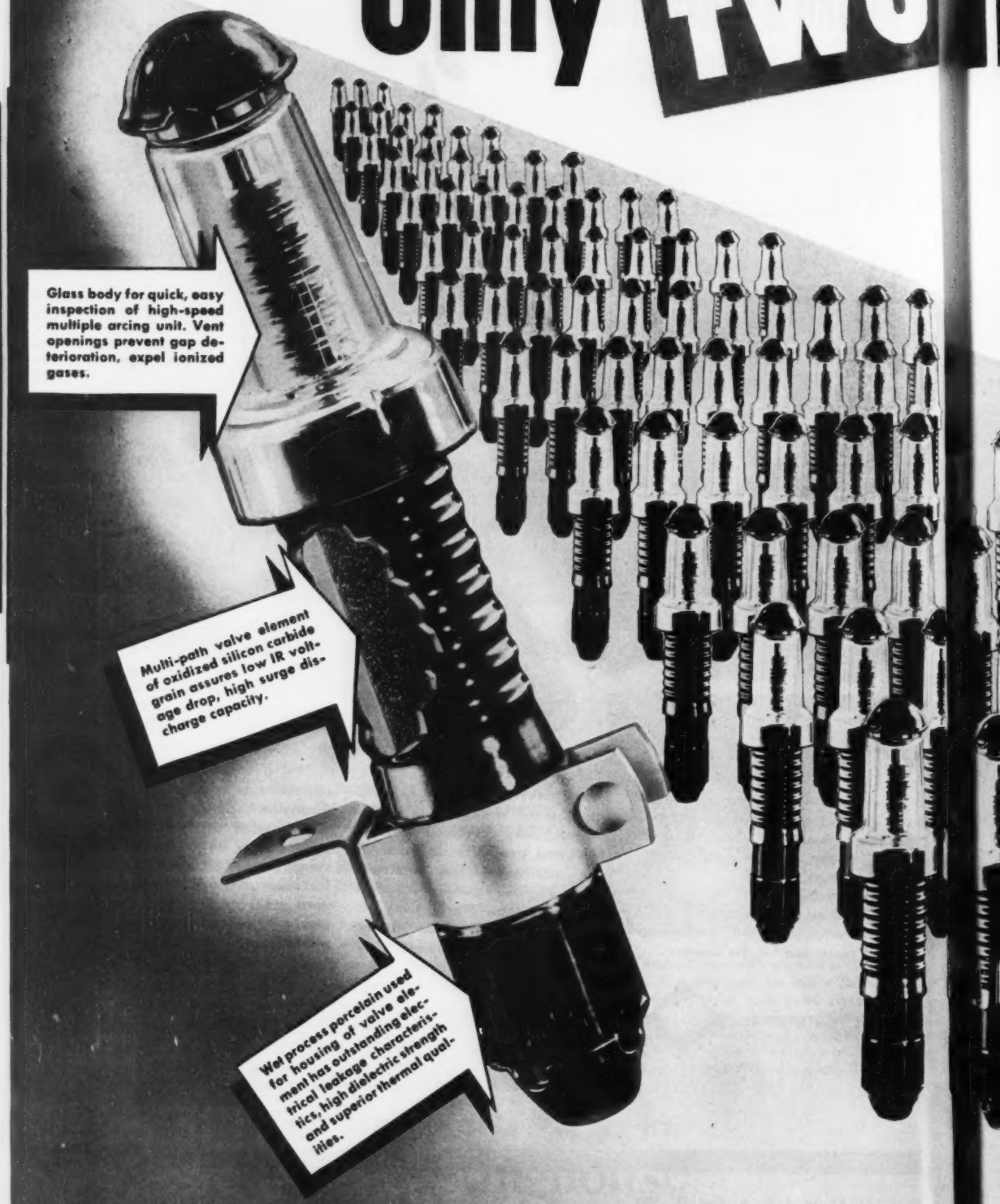
THE NAME TO REMEMBER... CDF MICABOND

Continental-Diamond Fibre Company

NEWARK 15, DELAWARE

Only TWO


Glass body for quick, easy inspection of high-speed multiple arcing unit. Vent openings prevent gap deterioration, expel ionized gases.
Multi-path valve element of oxidized silicon carbide grain assures low IR voltage drop, high surge discharge capacity.
Wet process porcelain used for housing of valve element has outstanding electrical leakage characteristics, high dielectric strength and superior thermal qualities.

in 500,000

LIGHTNING ARRESTER YEARS

ONLY TWO FAILURES MAR PERFECT RECORD OF TIME-PROVED DEPENDABILITY

Throughout 500,000 lightning arrester years, only two Crystal Valve Ventilated Gap Lightning Arresters have ever failed. Thousands upon thousands have given year after year of trouble-free protection, under every operating condition, all over the world.

First introduced in 1936, this time-tested arrester has never required any major change in design. Today, as then, gap ventilation assures freedom from gap corrosion . . . interior is always clean and dry. Vents expel conductive ionized gases, bring in fresh air for high resistance to circuit current.

The same "Ultra-speed" gap is still service-engineered to be the fastest gap in the industry. The same oxidized silicon carbide grain provides a multi-path valve element for quick uniform distribution of surge discharge and fast suppression of follow current.

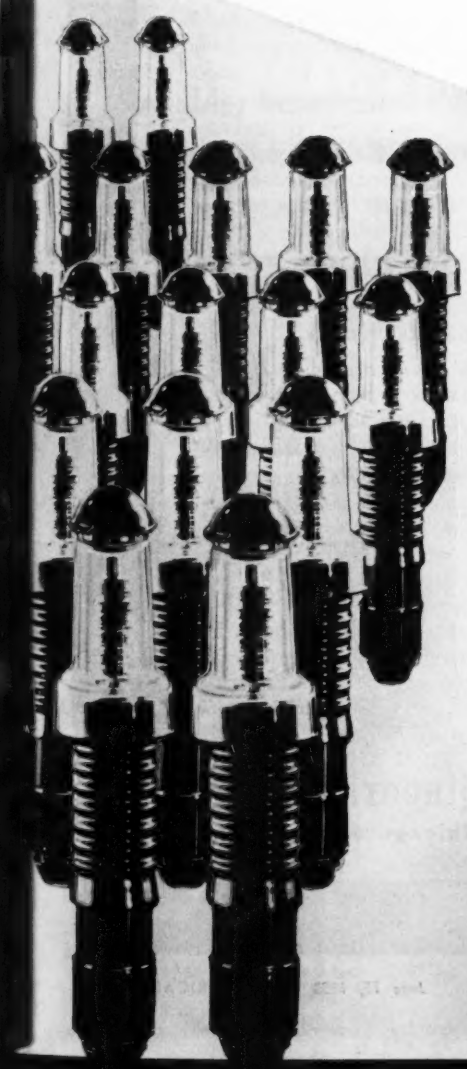
Crystal Valves combine every modern scientific advancement with the time-proved reliability of the vented gap. For dependable protection, under every weather and lightning condition, install Crystal Valve Ventilated Gap Arresters on every transformer.

Write today for illustrated folder with full details

ELECTRIC SERVICE MANUFACTURING CO.

PHILADELPHIA 32, PA.

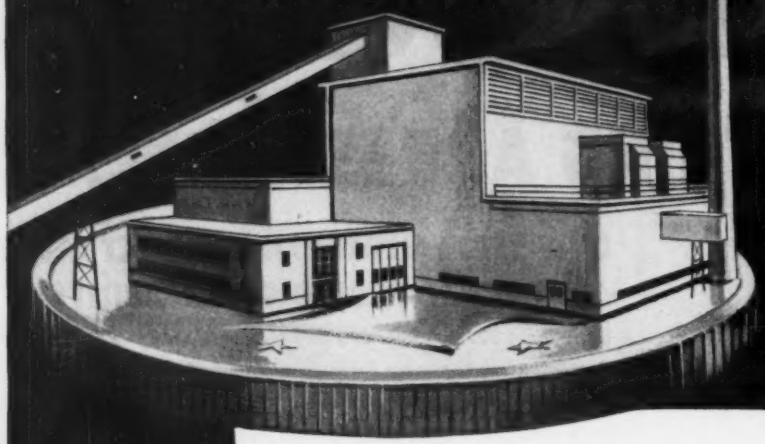
Represented in Canada by Lyman Tube and Bearings, Ltd., Montreal and Toronto



CRYSTAL VALVE
Ventilated Gap
LIGHTNING ARRESTERS

Service Engineered by ELECTRIC SERVICE

The Proper Power Plant for You Requires MORE THAN GOOD DESIGN



Today more than ever prudence requires that a sizable fixed investment such as a power facility be carefully integrated with the corporation's financial structure and founded on an accurate anticipation of the company's load, possible sources of power and future economic trends.

Such forehandedness is an integral part of Pioneer's power plant design work, for Pioneer is not only a consulting and design engineering group but an organization of financial and economic specialists as well, and the two points of view guide and temper one another.

Our past and current power plant work recommends that you bring Pioneer into the early discussion of your power needs.

Does Your Power Plant Leak Profits?

Industrial plant owners as well as utilities can use our operating consulting service profitably to discover ways of improving equipment performance and reducing operating costs.

Are you using the most economical fuel in the most economical way?

Are you using labor to the best advantage?

Are you obtaining maximum performance from the equipment you have installed?

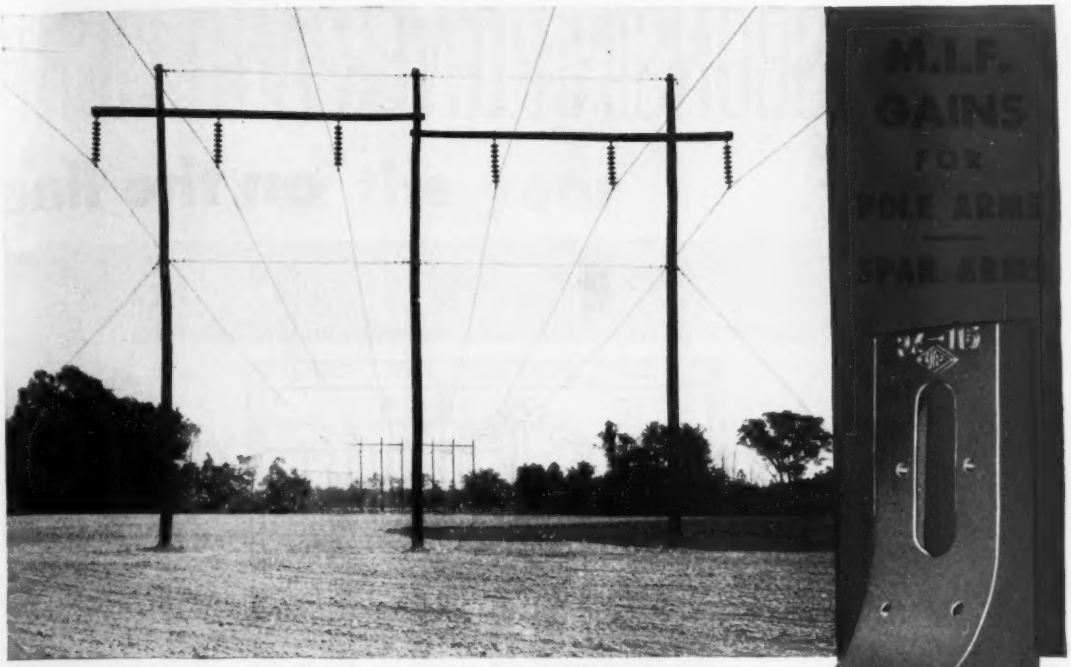
Are there methods of improving your operation by adding supplementary equipment which will more than pay its way?

Our consulting service is based on over fifty years of both design and operating experience. You may be sure, however, that our suggestions will balance between the ideal and the practical, for Pioneer's management viewpoint always balances Pioneer's engineering — an investment safeguard for you.

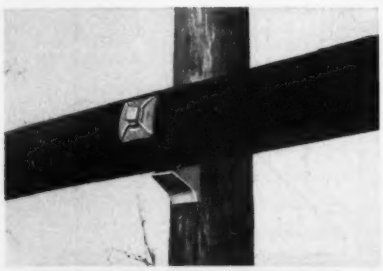
Pioneer Service & Engineering Co.

231 South La Salle Street · Chicago 4, Illinois

51 YEARS



Dependable, Economical Pole Arm Installations with M.I.F. GAINS and Single Bolts



- Each M.I.F. Gain secured with one through bolt — reduces number of holes.
- Accommodates wide range of arm diameters — keeps inventory to a minimum.
- Permits through bolt to pass through diametric center of arm — arms can be pre-drilled; no costly spotting and drilling in the field.
- Enables pole arm to contact both vertical and "shelf" surfaces — lower portion of Gain offers "wedge" against vertical movement.
- Provides both *vertical* and *transverse* stability — wide heel pad, large spurs.
- Places through bolt in tension — not in shear.

M.I.F. CURVED WASHERS, available in sizes for all requirements, assure adequate support against both arm and pole.

SPECIFICATIONS

Malleable Iron Castings, Hot Dip Galvanized	PX115	PX116
Size of arms accommodated	6½" to 12½"	9" to 15"
Dimensions of through bolt slot	1 1/16" x 3½"	1 1/16" x 3"
Weight each	5 lbs.	8 lbs.

Provided with tapped hole for bonding connection when specified.

MALLEABLE IRON FITTINGS CO.

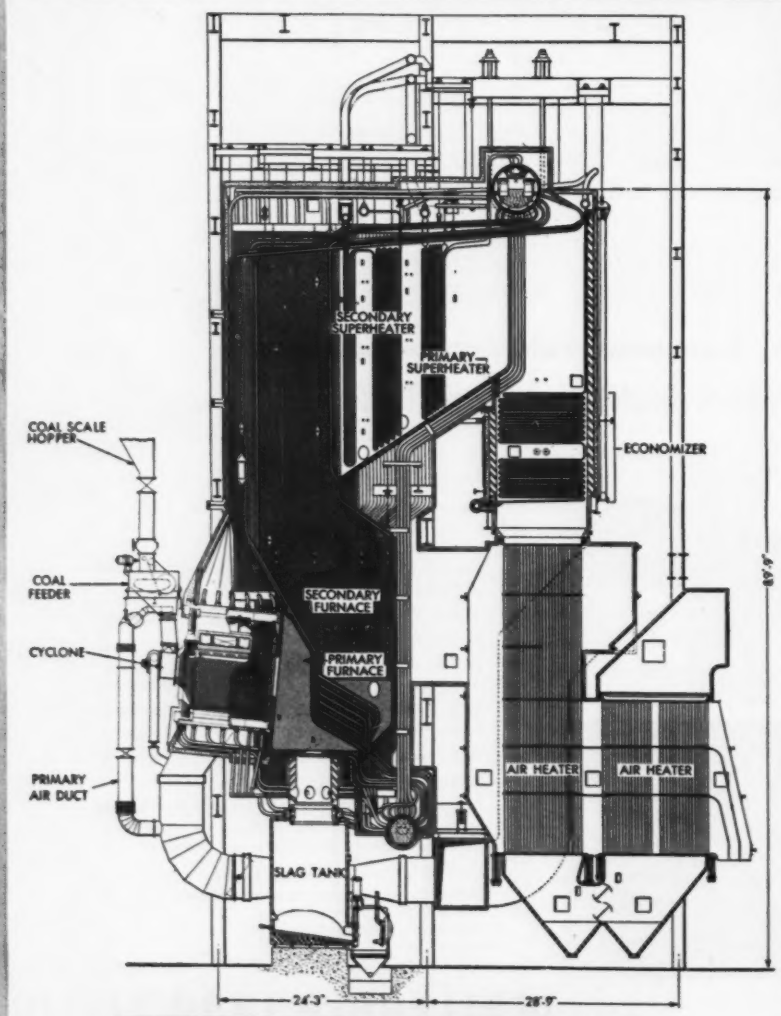
Pole Hardware Division — **Branford, Connecticut**

N. Y. Office: 30 Church St. • Canadian Mfr. & Dist.: Line & Cable Accessories, Ltd. Toronto

Representatives: William J. Cottrell Co., Portland, Ore. • James H. Drew Corp., Indianapolis, Ind. • Industrial Engr. & Equip. Corp., Los Angeles, Cal. • JSG Electric Co., Chicago, Ill. • S. H. McCoin, Knoxville, Tenn. • E. A. Thornwell, Inc., Atlanta, Georgia • J. P. Voight, Summerville, S. C. • Waltham, DeWitt & Krusi, San Francisco, Calif. • L. G. Wendegats, Kansas City, Mo. • Williams Sales Co., Fort Myers, Fla. • Williamson Sales Co., Shreveport, La. • O. C. Witte Co., Detroit, Mich.

WISCONSIN POWER AND LIGHT

on the line

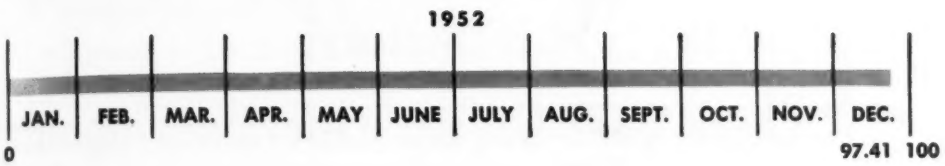


B&W CYCLONE-FIRED RADIANT BOILER

This unit has a steam generating capacity of 600,000 pounds per hour, with superheater outlet conditions of 1325 psi and 960F. It has a design pressure of 1525 psi and employs natural circulation. The boiler is equipped with a superheater, an economizer, and a vertical tubular air heater.

COMPANY'S CYCLONE-FIRED BOILER

97.41% of the year



at EDGEWATER PLANT

This outstanding record for a coal-burning unit was established during 1952 by the operators of Wisconsin Power and Light's Cyclone-Fired B&W Radiant boiler at the Edgewater Plant.

Cyclone Furnaces make a major contribution to high availability because they eliminate so much of the coal preparing equipment that is a source of continuous maintenance and possible outage. Cyclones burn coal that is merely crushed, not pulverized. This means that banks of many pulverizers, with their moving parts, motors, fans, lubricating systems, burners, piping and ducts, are eliminated. They are replaced by a few sturdy, simple Cyclone Furnaces.

Ease of operation and increased safety with the Cyclone Furnace are also important factors that mean sustained on-the-line performance. There are far fewer burners to light with Cyclone Furnaces, and because they use crushed coal, they eliminate the danger of furnace explosions that might occur with powdered fuel.

Further, by keeping the ash where it belongs—in the furnace—and severely reducing the amount of fly ash in the combustion gas, the Cyclone Furnace further contributes to high levels of operation. Ash accumulations on boiler and other surfaces are curtailed, and wear on boiler parts, and on machinery such as induced-draft fans, is greatly reduced.

Increased availability is just one of the many advantages to be obtained from Cyclone Furnace Firing. Other important benefits include reduced atmospheric pollution and a money-saving solution to the fly-ash problem, reduced cost of maintenance, greater efficiency, and boiler-room space savings.

Twenty B&W Cyclone-Fired Boilers are now in operation and have a total accumulated service time of over 50 years. Many other Cyclone-fired boilers are under construction.

We will be pleased to discuss with you the many positive advantages which Cyclone Furnace Firing can contribute to your operations. The Babcock & Wilcox Co., Boiler Division, 161 East 42nd Street, New York 17, N. Y.

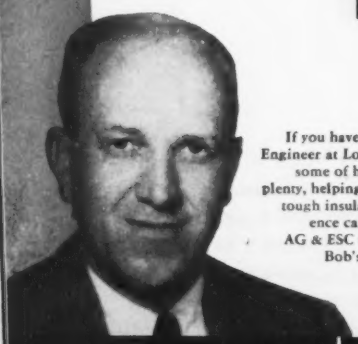
BABCOCK & WILCOX
BOILER DIVISION

G-609

HOW TO TELL

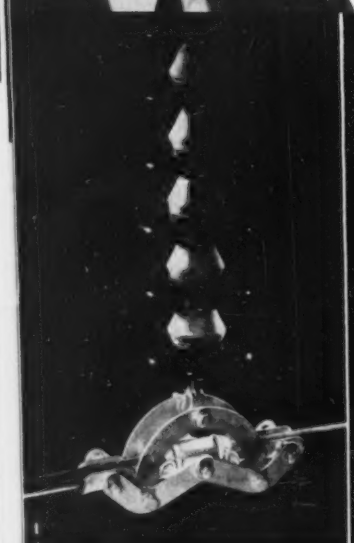
whether you're getting your money's worth . . . in insulators!

"Check your buying experience against this case of American Gas & Electric Service Corporation," suggests Bob McCoy. "You'll know!"



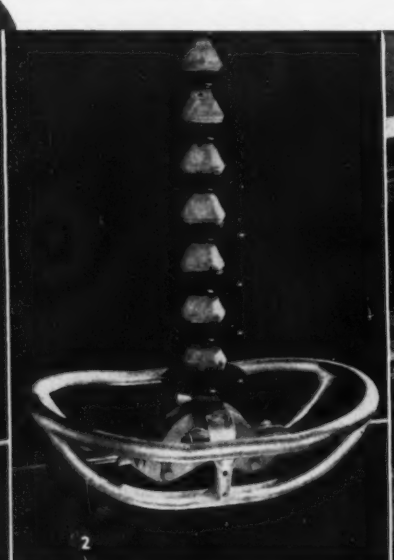
ROBERT L. "BOB" McCOY

If you haven't met Bob McCoy—chief Design Engineer at Locke . . . you probably know about some of his achievements. Bob gets around, plenty, helping Locke customers lick all kinds of tough insulator problems. His 28-year experience came in mighty handy in this case of AG & ESC which Bob describes for you here. Bob's *our* man . . . but remember, when you've got a "toughie," he's *yours* for the asking!



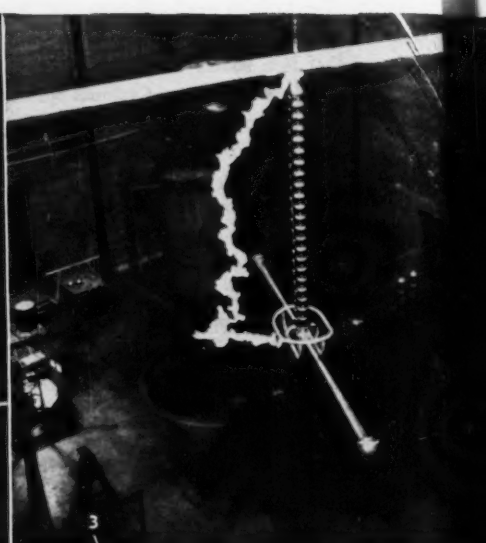
1

New Suspension Clamp Developed — To support the large, hollow copper conductors used on the TIDD 500 kv experimental line, Locke designed and furnished a radically new articulated suspension clamp, much shorter and lighter than conventional clamps. Overall length of the new Locke clamp is 18 inches long, compared with the 32 inch overall length of a conventional clamp.



2

New Corona Shield Developed — To lick the corona problem on the TIDD 500 kv transmission line experiment Locke developed a new concept in corona shields. These shields graded the insulator strings and suppressed corona on the lower, highly stressed units. They also enveloped the suspension clamp, thus removing it from the high voltage field and suppressing corona on any part of the clamp itself.



3

Valuable New Data was revealed by extensive flashover tests conducted in the Fred M. Locke High Voltage Laboratory on varied suspension strings. These flashover tests were made with the insulators supported in a specially developed test rig to simulate true electrical conditions. As a result, important data was developed which helped establish the proper number of insulators to use per string.

"When a new high voltage system was planned by the American Gas & Electric Service Corporation, Locke was given an opportunity to participate in the early development stage . . : and follow through to the conclusion," explains Bob.

"Our first job was to cooperate in the company's TIDD 500 kv transmission research project. At this voltage, one of the big problems was corona suppression. The pictures show the special products Locke developed to help the company lick this problem.

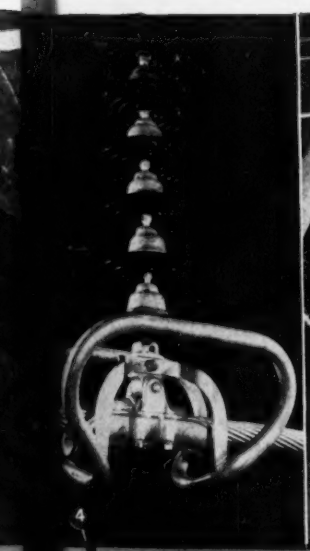
"After the experimental TIDD tests were completed, it was decided that 330 kv best suited the system's requirements. Naturally, this called for a re-study of the whole problem with emphasis on reducing size and cost, as well as how to make hot line maintenance work easier and safer. Here again the pictures show you what Locke did to help AG&E lick the problem.

"In my opinion," observes Bob, "this is an outstanding case of how Locke can . . . and does . . . provide unusual and often most unexpected services for its customers. And remember—all of these 'service extras' are included in the regular price you pay for Locke insulators.

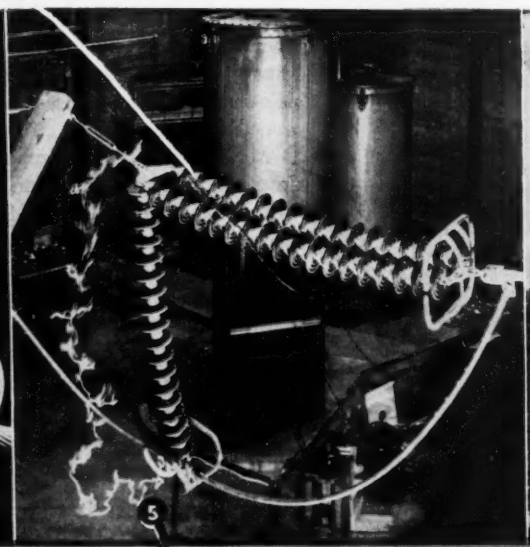
"So whenever you run into a problem of insulator design or application," urges Bob, "bring it to Locke. Your problem will be solved with the aid of one of the world's finest high voltage and mechanical research and development laboratories . . . staffed by engineers who are experts in the design and operation of insulators, as well as associated fittings."

LOCKE

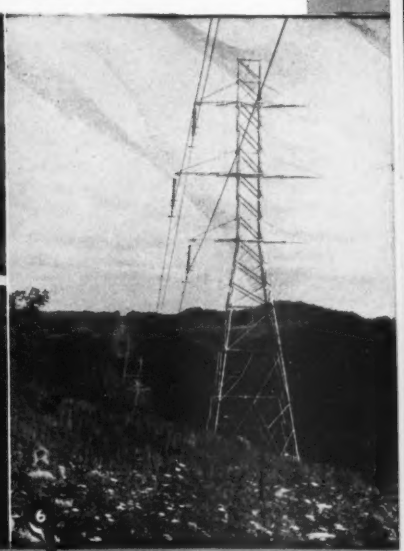
LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND



Hot Line Work Made Easier and Safer—At the conclusion of the TIDD tests, it was decided that 330 kv best suited the system's requirements. The entire problem was re-studied with an eye toward reducing size and cost and to make hot line maintenance easier and safer. The light weight, aluminum corona shields which can be removed and replaced on the suspension strings by removing only one self-locking nut was Locke's answer to the hot line maintenance problem.



Shield Removal Made Easier—In the case of the dead-end strings, Locke developed shields which can be removed and replaced by removing only two self-locking nuts. Instead of the shield being made in two halves, a one-piece shield was developed having an opening on the under side to clear the jumper loop. This one-piece shield was supported by two supports from the upper side with which bolts for attaching to the strain yoke were made integral.



Lines Now Operating—Today the first of these extra high voltage lines is in operation at 138 kv on the system of the Appalachian Electric Power Company. Half of this line is Locke equipped. Based on Locke laboratory tests made on the Tidd Line, the company has complete confidence that the lines will perform as expected when the new 330 kv service is made available. Locke welcomes unusual opportunities like this to assist its customers.

Duquesne Light Co. of Pittsburgh Gears Up for Expanded Service at LOWER COST!

Central Dispatcher helps get repair crews directly to trouble spots, saves outage time and mileage with complete, instant control of operations.

MOTOROLA 2-Way Radio

speeds communications over 800 square-mile area, increases efficiency of 80 mobile units!

Duquesne Light Company relies upon Motorola 2-way communications to co-ordinate operations and improve service throughout its expanding network of power lines in Pittsburgh.

Instant push-button contact with mobile crews increases efficiency of men and equipment. In emergencies Motorola-flashed orders rush men to the scene . . . crews closest to trouble areas can be spotted quickly.

Motorola job-tested components and circuits give low operating and maintenance costs. Advanced design assures obsolescence-free service. Motorola provides complete system availability—Handie-Talkie® radiophones, mobile and fixed station equipment, point-to-point microwave, carrier and industrial supervisory control systems. Investigate Motorola, for radio communication that pays for itself over and over again!

Write to Dept. 2286-EW today for the complete Motorola story!

Line Crew Foreman keeps dispatcher informed of job progress... calls for needed men, supplies or instructions with dependable Motorola mobile radio.

Uni-Channel Sensicon Dispatcher serves as a fixed or mobile station. Built-in Permakay filter eliminates 15 nuisance tuning adjustments. Ruggedly built to take jolts and shocks of rough roads.

2-way Radio

Motorola

Communications & Electronics, Inc.

A SUBSIDIARY OF MOTOROLA INC.

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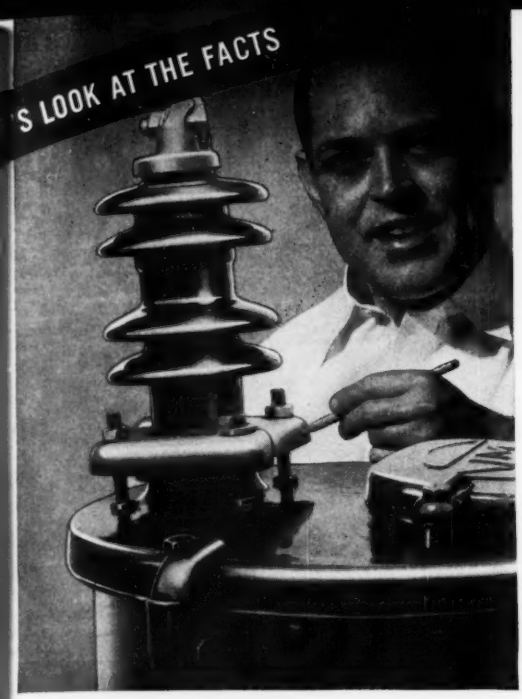


FIGURE 1. Cover bushings on an L-M Round-Wound 15 kva 7200 volt transformer. Note the generous width of skirting for high creepage distance, the four-bolt cover clamp that assures even pressure on gasket and porcelain.

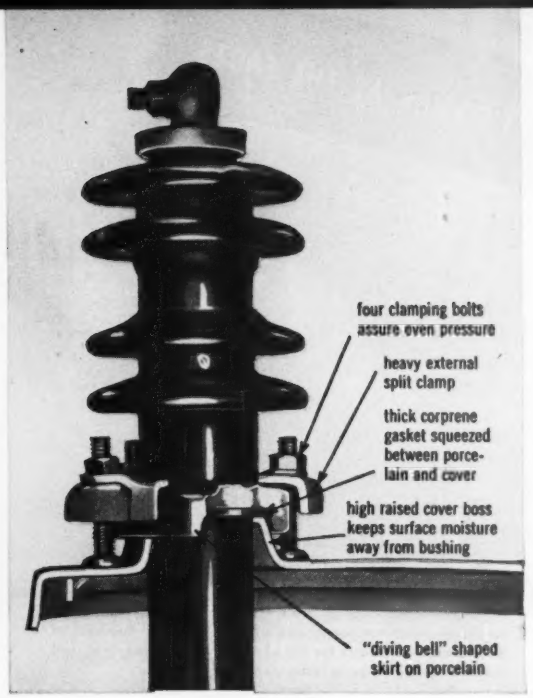

four clamping bolts assure even pressure
heavy external split clamp
thick corprene gasket squeezed between porcelain and cover
high raised cover boss keeps surface moisture away from bushing
"diving bell" shaped skirt on porcelain

FIGURE 2. Close-up of triple-seal against moisture. 1. Deep-skirted porcelain gives "diving bell" effect. 2. Thick corprene gasket, squeezed between porcelain and steel boss. 3. Deep-drawn cover boss keeps moisture away.

Cover Bushings on L-M Round-Wound Transformers Triple-Protected Against Moisture, Corona

"Diving Bell" design porcelain, thick corprene gasket, and high raised boss on cover provide triple barrier

By **ALVIN B. COYLE,**
Manager Transformer Sales
Line Material Company

In the design of cover bushings, L-M engineers have gone to great lengths to eliminate moisture entrance and corona, which would cause undesirable radio interference.

The porcelain itself is designed with exceptionally generous creepage distance and high wet-flashover characteristics. The best grades of electrical porcelain are used, with the surface fully glazed. At the bottom is an extra skirt or lip, which is curved downward to give a "diving bell" effect in keeping moisture away from the gasket.

The porcelain is mounted on an exceptionally high raised boss in the cover, which in itself leads moisture away from the bushing. Between the boss and the porcelain is a thick corprene gasket tightly squeezed by the four-bolt cover clamp. Corprene has the initial hermetic sealing property of synthetic rubber plus the elasticity and non-flowing characteristics of cork to maintain a permanent vapor-proof seal.

The result is a bushing that provides exceptional protection against moisture and breathing; it is corona-free and causes no radio interference.

Get Full Information

These cover bushings are standard equipment on all L-M Round-Wound transformers of 5000 volts and over. For more information on these and other features of these outstanding distribution transformers, ask the L-M Field Engineer; or write Mr. Coyle at the Transformer Division, Line Material Company, Zanesville, Ohio (a McGraw Electric Company Division).

"Round Wound" is a Line Material Company trademark.

LINE MATERIAL 878

Transformers

Complete Coordinated Equipment for Distribution Today

LM ORTO

LET'S LOOK AT THE FACTS

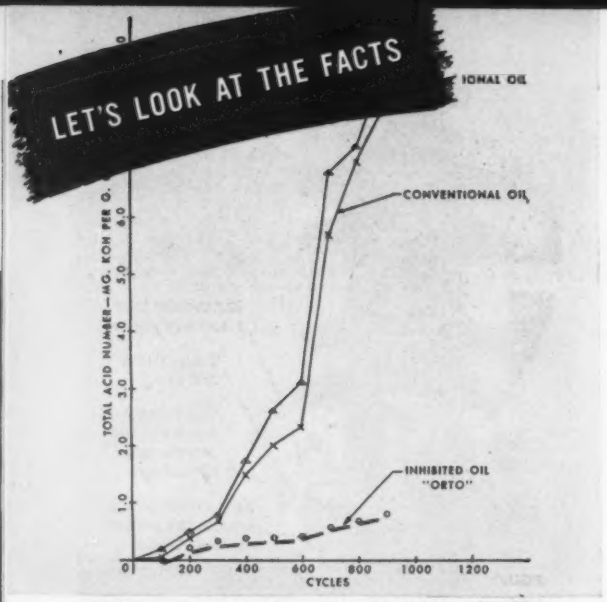


FIGURE 1—Comparison of acids formed by inhibited (ORTO) oil and conventional transformer oils in laboratory tests. Reduction of acid formation increases the life of the oil two to three times, and prolongs the life of the cellulose insulation.

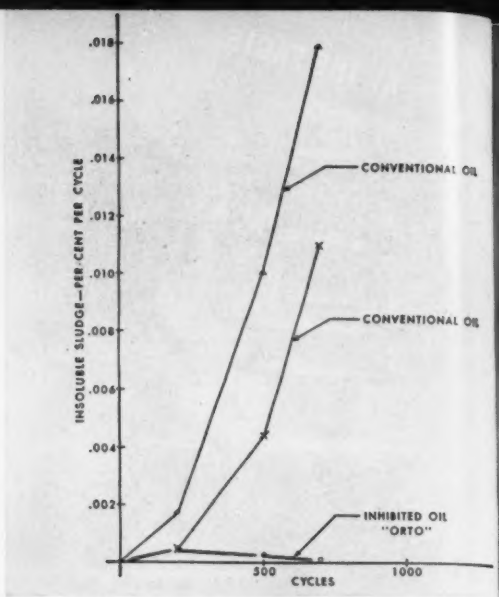


FIGURE 2—Comparison of sludge formation in conventional and inhibited (ORTO) oils in laboratory tests. The prevention of sludge formation appreciably lengthens life of the oil and the transformer and maintains high overload capacity.

L-M's ORTO® Lengthens Transformer Life and Increases Overload Capacity

by **MARTIN I. ZWELLING,**
Chief Laboratory Engineer,
Transformer Division, Line Material Co.

The life of a transformer is largely determined by the life of the cellulose insulation. This, in turn, is dependent upon temperature of operation, formation of acids, and the length of time these two reactants are in effect.

Obviously the prevention of acid by an inhibitor eliminates one reactant (Figure 1). The prevention of sludge (Figure 2) modifies the other—temperature—by permitting free oil circulation, and thus keeps cellulose deterioration at a low rate. Surge strength and short-circuit strength are maintained at high levels throughout the transformer's life span.

Maintains Overload Capacity

Generally speaking, inhibited oil will improve overload capacity by maintaining the original capacity of the transformer over a greater proportion of its life. Actually, in high magnitude, short duration overloads, the temperature of the oil does not increase to any great degree, and heat affects only the cellulose insulation. But if the prevention of acid formation has protected the cellulose insulation from deterioration, the transformer is better able to handle a high short-time overload without damage.

In the case of long time, low magnitude overloads, the use of an inhibited oil such as ORTO has an even more marked effect. In conventional oils, overload capacity will be decreased as oxidation builds up increasing amounts of acid and blanketing layers of sludge (Figure 3). By preventing the formation of acids and sludge, the transformer maintains its initial high overload capacity for a greater proportion of its life (Figure 4).

Lengthens Transformer Life

If an operator obtains a certain life expectancy from a transformer under certain operating conditions, life will be increased with an inhibited oil under these same operating conditions. Or, with the same operating conditions and the *same life expectancy*, a certain increase in the overload is possible with ORTO.

Long term tests (Figure 5) and short

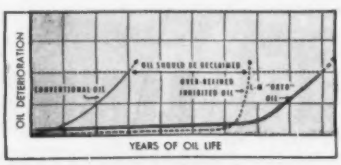


FIGURE 8—Comparative curves show the deterioration in service of a conventional oil, an inhibited over-refined oil, and ORTO brand oil, in which deterioration, when it finally starts, follows the same gradual curve as any high grade conventional oil.

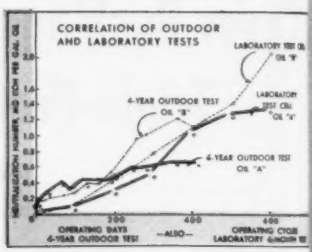


FIGURE 7—Typical curves showing the close correlation between the 4-year outdoor tests and the laboratory tests on two oils. This close correlation prevailed throughout on the various oils tested and in the wide variety of tests made.

term accelerated tests (Figure 6) have been made which show a marked degree of correlation (Figure 7). These tests indicate that the inhibitor in ORTO greatly prolongs oil life before acid and sludge deterioration commences, and that after this deterioration starts, ORTO follows the same gradual curve of any high grade conventional oil (Figure 8). The inhibitor has no harmful effects, it does not react with any other known inhibitor, and may be blended with other oils, new or reclaimed, inhibited or non-inhibited. Naturally when ORTO is blended with another oil a certain amount of dilution occurs which reduces the effective life extension properties of the inhibitor to the extent that ORTO is diluted. The overall effect of ORTO can be safely judged from the diagram.

FIGURE 3—Laboratory test coil after the equivalent of about 18 years service using a good grade of conventional oil. Notice the heavy sludge deposits, which have clogged oil passages, causing higher temperatures, deterioration of insulation, and lower overload capacity.

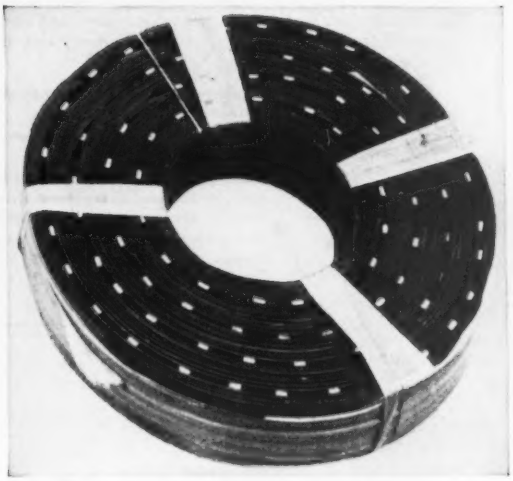


FIGURE 4—Here is an identical coil, after operating for the same period of time under the same conditions except that the oil was ORTO. Acid and sludge formation has been prevented; oil passages are clear; initial overload capacity and impulse strength have been maintained.

FIGURE 5—Outdoor tests started some years ago were used as a basis for developing accelerated laboratory tests. These outdoor tests were closely checked against other long time tests run by oil companies and utility companies, and were correlated with laboratory procedure.

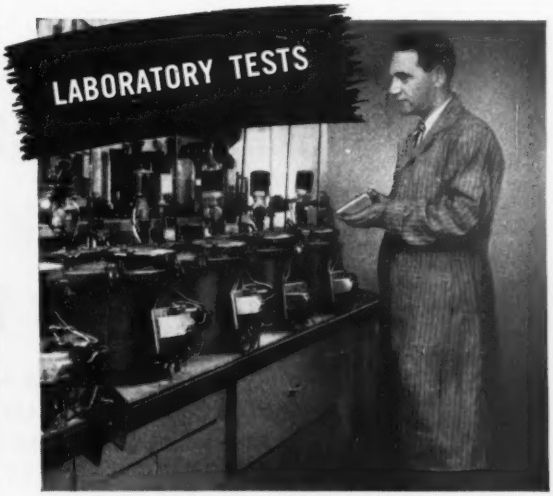


FIGURE 6—Laboratory equipment in which conventional and inhibited oils were tested under closely controlled conditions. The laboratory test permitted precise recording of acid and sludge formation and of deterioration of insulation, wire, and other parts of the transformer.

Look at the facts! Get details on L-M Round-Wound Transformers

L-M Round-Wound transformers consist of a wound core, with round coils wound directly onto the core, which therefore is not cut or unwound, and air gaps are not introduced.

Because of the design and the long, round coils, the transformers offer better regulation, high short time overload capacity, high impulse level and high short circuit strength, low exciting current, and better loss ratios. And they are filled with ORTO, L-M's outstanding Oxidation Resistant Transformer Oil!

Get the facts from the L-M Field Engineer, or write Mr. Zwelling at the Transformer Division, Line Material Company, Zanesville, Ohio (a McGraw Electric Company Division).

LINE MATERIAL
Transformers

ORTO

85

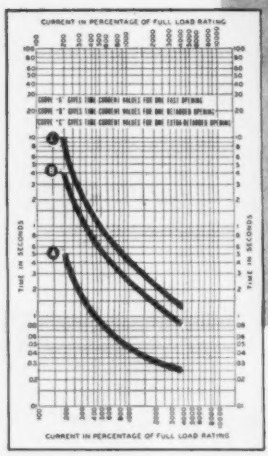
Complete Coordinated Equipment for Distribution Today

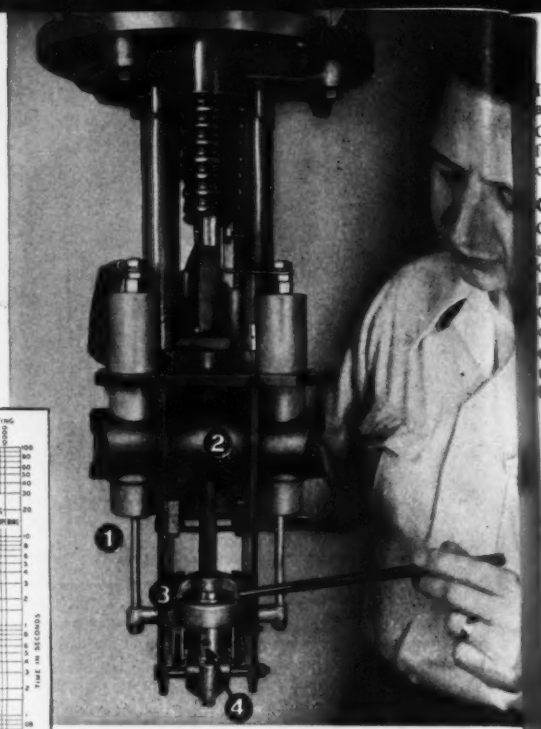
L-M's Kyle Type E 23 kv recloser outranks all others in its class for dependability, long service, low maintenance, and interrupting capacities. New higher interrupting capacity and 150 kv BIL assure ample safety factor.

"Universal" terminals for copper or aluminum conductor
Oil-filled clamp-on bushings—extremely low radio noise level
Heavy aluminum cover with operating handle, operations counter, and optional Kyle non-reclosing device lever under sleet hood
Heavy tank with welded bottom for better support, better protection
KYLE

CHOICE OF SEVEN SEQUENCES

Only Kyle reclosers offer choice of three time-current curves and seven standard operating sequences. Curve A, fast; curve B, retarded; curve C, extra-retarded. Permits close coordination with fuses and other reclosers in series.





Oil cross blast arc extinguishing mechanism. The contacts of fine arc-resisting material (1) draw two arcs in series. Gas formed by one arc blasts the oil in the cross-blast chamber (2) across the other arc, extinguishing it instantly. The engineer points to the contact buffer mechanism (3), which permits varying contact opening speed by means of a removable plug (4). This insures best interrupting performance at both 23kv and up to 14.4 kv.

L-M's KYLE Type E 23 kv Recloser Now Interrupts up to 1750 Amperes at 23 kv

To meet heavier load requirements, interrupting capacities are increased to 2500 amperes at 14.4 kv, 1750 amperes at 23 kv. Provides full 150 kv BIL insulation, giving greater insulation safety factor with longer life. For all distribution voltages from 2.4 to 23 kv.

The heavy insulation and the improved oil cross blast method of arc extinction make the Type E an outstanding recloser for high voltage application, and provide an intermediate duty recloser up to 14.4 kv.

Oil-filled clamp-on bushings provide radio noise level well below NEMA standards. Plated Universal terminals for either copper or aluminum conductor. The recloser is available with a choice of eight coil ratings, three time-current curves, and seven tripping sequences. Coils and sequences are easily changed *in the field.*

Like all Kyle reclosers, the Type E is filled with ORTO®, L-M's oxidation-resistant transformer oil.

Get details on this exceptional recloser, which has proved so successful in service. Ask the L-M Field Engineer for copy of bulletin on the Kyle Type E, or write Line Material Co., Milwaukee 1, Wisconsin (a McGraw Electric Company division).

Type E Single Phase
Nominal Rating 23 kv, BIL 150 kv

Rating Amperes	Minimum Tripping Current Ampere	Interrupting Ratings* Symmetrical RMS Amperes at Maximum Phase to Phase Nominal Voltage of: 14.4 kv	23 kv
5	10	200	125
10	20	400	250
15	30	600	375
25	50	1000	625
35	70	1400	875
50	100	2000	1250
70	140	2500	1750
100	200	2500	1750

*Recloser interrupting ratings are based on the maximum test circuit X/R ratio of not less than 8, and the asymmetrical rating in total RMS amperes is 1.4 times the symmetrical ratings given in the table.

LINE MATERIAL
Kyle® Reclosers

COMPLETE COORDINATED AUTOMATIC PROTECTION FROM SUBSTATION TO LOAD

96

Interrupting ratings now up to 6000 amperes at 4.8 kv, 4000 amperes at 14.4.

Complete range of nominal load ratings from 25 to 200 amperes, for 2.4 to 14.4 kv service, makes available the greatest number of sectionalizing points in this class.

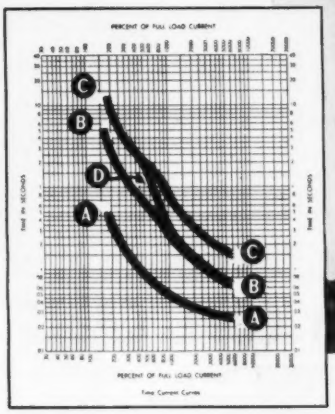
Only Recloser with:

Choice of four time-current curves, ten tripping sequences, which gives maximum flexibility in meeting all coordination problems on heavily loaded distribution circuits.

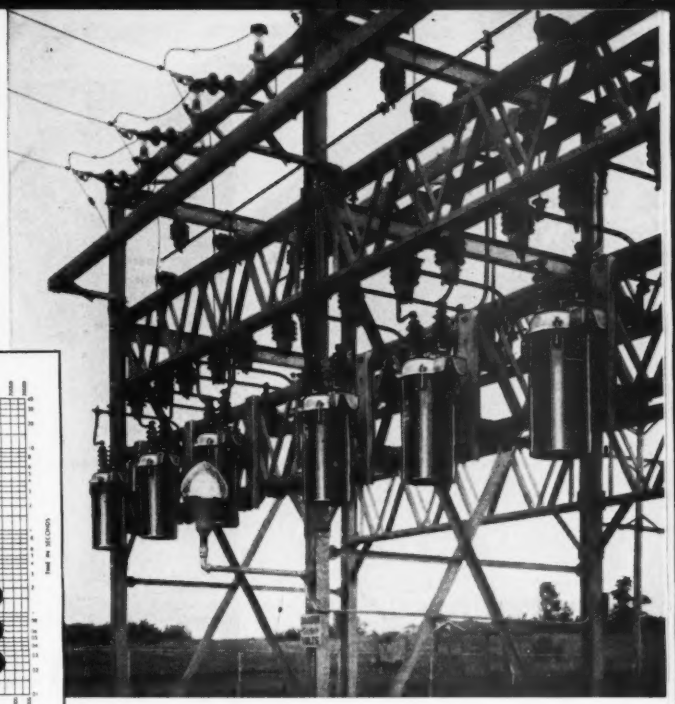
Full power-class design, with 110 kv basic insulation level.

Clamp-on bushings, with plated Universal terminals for copper or aluminum conductor.

Oil Cross Blast arc interruption insures rapid clearing of heavy faults.



Only recloser with choice of 4 time-current curves and 10 operating sequences. Coils and sequences are easily changed in the field.



Kyle Type L Reclosers at a middle-western power company substation, where they help assure uninterrupted service to an urban area.

L-M Increases Interrupting Rating, Adds 200-amp Rating to Kyle Type L Recloser

To protect substations and feeders with heavier loads and higher fault currents, L-M has added a 200-ampere rating to the Kyle Type L Recloser, and has increased interrupting ratings appreciably.

The higher interrupting ratings are based on extensive testing of production reclosers, as well as field experience, and apply to Kyle Type L Reclosers already delivered.

The new higher nominal load rating involves a new coil and some increase in the capacity of certain current carrying parts. The changes can easily be made on any Type L reclosers now in service if desired.

The Kyle Type L not only handles present heavy loads, but it offers increased capacity for the future, plus the present benefits of Type L performance and economy. It provides complete coordination with fuses and other reclosers in series, with a corresponding reduction in fuse blowing and service calls.

Heavy Duty
Type L Single Phase
Nominal Rating 14.4 kv, BIL 110 kv

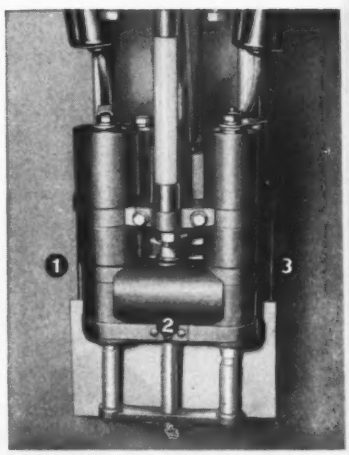
Rating Amperes	Minimum Tripping Current Amperes	Interrupting Ratings* Symmetrical RMS Amperes at Maximum Phase to Phase Nominal Voltage of: 4.8 kv	14.4 kv
25	50	1500	1500
35	70	2100	2100
50	100	3000	3000
70	140	4200	4000
100	200	6000	4000
140	280	6000	4000
200	400	6000	4000

*Recloser interrupting ratings are based on the maximum test circuit X/R ratio of not less than 8, and the asymmetrical rating in total RMS amperes is 1.4 times the symmetrical ratings given in the table.

Get the Details

Ask the L-M Field Engineer for full information on the Type L and other Kyle Reclosers providing complete, coordinated protection; or write for a copy of bulletin CR-1A. Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

Kyle Reclosers are filled with ORTO®, L-M's oxidation-resistant transformer oil.



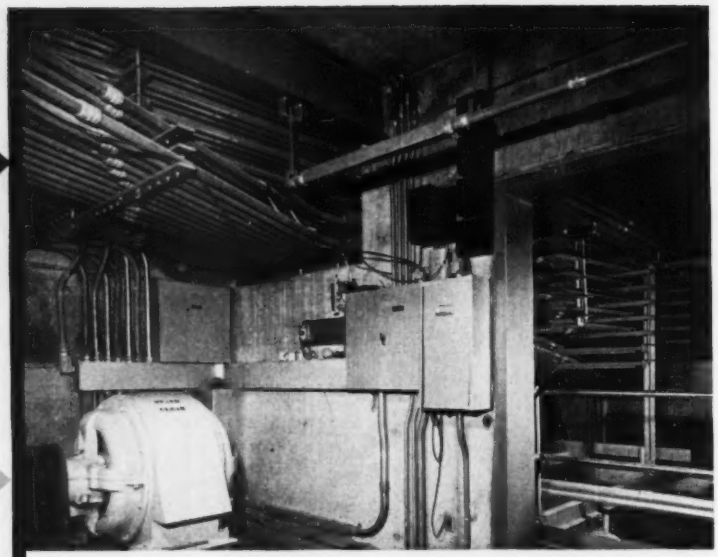
Rapid oil cross blast arc interruption. Double contacts draw two arcs in series. Gas from one arc at 1 blasts oil in chamber, 2, across arc at 3, extinguishing it.

LINE MATERIAL
Kyle® Reclosers

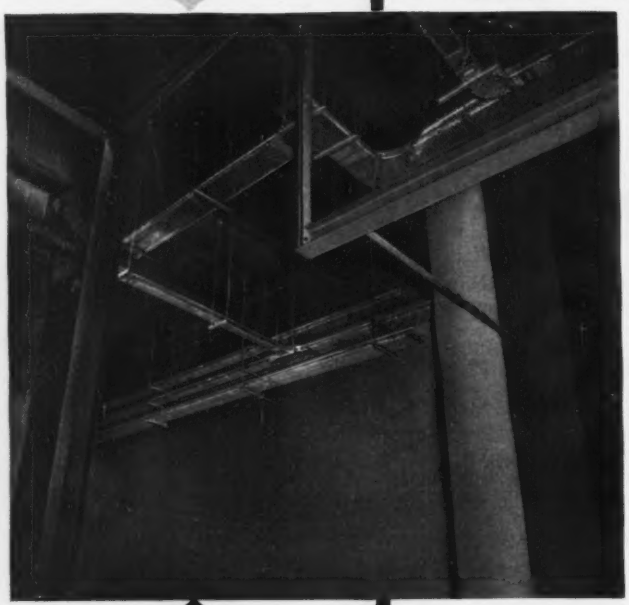
99

what a difference

what a saving



...with COPE CABLE TROUGH



SEEING IS BELIEVING! Here you can see at a glance the time, material and labor savings possible on cable installations through the use of Cope Cable Trough. Both of these photographs were taken at the City of Glendale (California) generating plant. The upper and older installation shows 126 - 1¼" conduits containing cables for controlling the auxiliaries for two turbine generators. Just look at the tremendous number of bends and fittings, and the complicated hanger construction needed to support this maze of conduit. You can imagine the high cost of engineering, material, and installation this entailed, even before the big job of pulling cable through the conduits was possible.

Now examine the lower, recent installation (view taken during construction) involving control of two additional generators, where cables for control conduits 480 volt auxiliary power, and 2400 volt auxiliary power are carried in Cope Cable Trough. It was a simple job to lay out and erect this trough using standard lengths and fittings. Costs were but a fraction of the older method; time and material were saved and accessibility for visual cable inspection is provided. Additional cables may be added with great ease.

You, too, can make such savings.

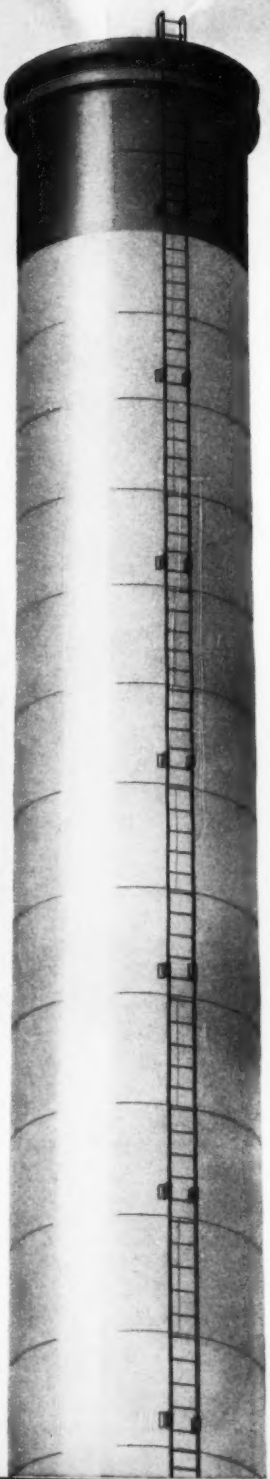
T.J. Cope INC.

A detailed bulletin giving all the facts about Cope Cable Trough will be sent upon request. Write for it.

You know Cope by these products

711 SOUTH 50th ST. • PHILADELPHIA 43 • PA.

American Blower . . . a time-honored name in air handling



Proved procedure for minimizing a nuisance

Important power plants all over the country have found this procedure helpful in solving their fly-ash problems. You will, too. Here's all you have to do:

1. Contact your nearest American Blower or Canadian Sirocco Branch Office. They are conveniently located throughout the United States and Canada.
2. Our competent engineers will show you (or your engineering counsel) the advantages of installing Type ST Fly Ash Precipitators to meet your specific needs.
3. Your precipitators will be completely assembled at the factory, then partially disassembled into convenient sections and shipped to your plant for installation.

PRIMARY CONCENTRATOR
BREECHING FROM BOILER OR AIR HEATER
BREECHING TO INDUCED DRAFT FAN
SECONDARY VENT FAN
SECONDARY SEPARATOR DISCHARGES THE FLY ASH TO AN AIR-TIGHT RECEPTACLE OR SEALED ASH DISPOSAL SYSTEM

AMERICAN BLOWER

AMERICAN BLOWER CORPORATION, DETROIT 32, MICH.
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONT.

Division of American Radiator & Standard Sanitary corporation

Serving home and industry

AMERICAN-STANDARD · AMERICAN BLOWER · CHURCH SEATS & WALL TILE · DETROIT CONTROLS · KEWANEE BOILERS · ROSS HEATER

American Blower Type H Heavy Duty Steam Coil and component parts. The entire heating element is removable from the casing and can be completely dismantled for inspection, maintenance and repair. Individual tubes are replaceable.

Memo to Power Plant Men —

American Blower Heavy Duty Steam Coils were developed for you for the sole purpose of providing a heating coil possessing great strength ... corrosion resistance ... ease of maintenance, and complete accessibility.

For heavy loads at high pressures, investigate them now!

AMERICAN BLOWER

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

Serving home and industry

AMERICAN-STANDARD · AMERICAN BLOWER · CHURCH SEATS & WALL TILE · DETROIT CONTROLS · KEWANEE BOILERS · ROSS HEA

Here is the rugged FWD Light Duty LD, that's a great "go anywhere" unit for many general maintenance assignments.

FWD "Mobilized Tools" help you speed work, simplify service!

For more efficient line work choose from more than 78 perfectly matched combinations of truck, body and tools

Whether it's for line construction or maintenance, there's an FWD "Mobilized Tool" to meet your exact requirements. And your FWD dealer is prepared to offer you excellent service and supply on the complete unit.

When you buy FWD, you simplify purchasing, pinpoint responsibility. And, you're assured the service source that can competently service the complete "Mobilized Tool."

These installations illustrate only a few of the more than 78 matched combinations you can choose from. Ask your FWD dealer to give you all the facts . . . show you why an FWD is your best buy. He'll be pleased to help you select the right "Mobilized Tool" for your particular work.

THE FOUR WHEEL DRIVE AUTO CO.
Clintonville, Wis • *Canadian Factory*: Kitchener, Ont.

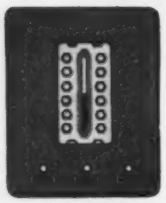
This sturdy FWD model HAU not only bores holes with the auger, but uses its integral derrick to set the pole.

This cab-over-engine FWD operates in really rugged country, frequently in extremely bad weather. Carries a crew of five . . . can be equipped for either maintenance or construction work.

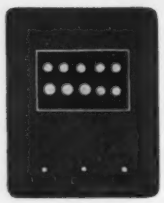
Equipped with ¾ line body, auger and tripod derrick, this FWD speeds line construction along the highway or cross-country.

Built by the makers of America's Foremost Heavy-Duty Trucks

RAPIDLY GROWING *LIST OF UTILITIES*
Using the DIAMOND "UTILISCOPE"
(WIRED TELEVISION)



Boiler water level observation



Burner pilot observation

Boiler furnace combustion observation

Stack smoke discharge observation

Utilities listed below have purchased the Diamond "Utiliscope" for one or more of the uses shown. Images are brought to the boiler control panel where the operator can see them at all times.

The "Utiliscope" is simple, stable, remarkably durable. It requires no technical skill for operation. Cost is low and is quickly amortized by labor saving and improved operation. Write for Bulletin 1025W.

Alabama Power Co.
Barry Steam Station

***Appalachian Electric Power Co.**
Philip Sporn Plant
Kanawha River Plant

***Board of Water & Electric Light Comm.**
Ottawa Station
Lansing, Mich.

Central Hudson Gas & Electric Corp.
Danskammer Station

Charbonnazza de France
Power Station De Chocques

***Cincinnati Gas & Electric Co.**
Miami Fort Station
Walter C. Beckjord Station

Cleveland Electric Illuminating Co.
Eastlake Plant

***Commonwealth Edison Co.**
Fisk Street Station
Ridgeland Station
State Line Station

***Consolidated Edison Co.**
Hellgate Station
Hudson Avenue Station
Waterside Station
East River Station
Astoria Station

***Dayton Power & Light Co.**
Hutchings Station

Detroit Edison Co.
St. Clair Station

***Duke Power Co.**
Dan River Station
Lee Station
Riverbend Station
Buck Station

***Elecktricitatsetsaakskabet**
Kydnby Power Station
Isefyordraerkat,
Denmark

***Electricite de France**
Nantes Chivire Station
Arrighi Station

Gulf States Utilities
Nelson Station

***Illinois Power Co.**
Wood River Station

***Indiana & Michigan Elec. Co.**
Twin Branch Station
Tanners Creek Station

Indianapolis Power & Light Co.
White River Station

Kansas Gas & Electric Co.
Murray Gill Station

***Long Island Lighting Co.**
Port Jefferson Station
Far Rockaway Station
Glenwood Landing Station

Louisiana Power & Light Co.
Nine Mile Point Station

Monongahela Power Co.
Albright Station

***New York State Electric & Gas Corp.**
Goudey Station
Greenidge Station

***Niagara Mohawk Power Corp.**
Dunkirk Station
Oswego Station
Huntley Station
Albany Steam Station

***Northern Indiana Public Service Co.**
Michigan City Station

Northern States Power Co.
Black Dog Station

***Ohio Power Co.**
Tidd Station
Philip Sporn Plant
Muskingum River Plant

***Oklahoma Gas & Electric Co.**
Mustang Station

Pacific Gas & Electric Co.
Moss Landing Steam Plant

***Philadelphia Electric Co.**
Delaware Station
Richmond Station
Cromby Station

***Public Service Co. of Northern Illinois**
Waukegan Station
Dixon Station
Will County Station

***Public Service Co. of Indiana**
Noblesville Station
Wabash River Station

Public Service Electric & Gas Co.
Kearny Station

San Diego Gas & Electric Co.
Silvergate Station

***Societa Edison—Italy**
Centrale de Genova
Centrale de Piacenza

South Carolina Generating Co.
Urquhart Station

***Southern California Edison Co.**
Etiwanda Station
Redondo Station

Southwestern Public Service Co.
Plant X

***Tennessee Valley Authority**
Johnsonville Steam Plant
Widows Creek Plant
Shawnee Steam Plant
Kingston Steam Plant
Colbert Station

Toledo Edison Co.
Acme Station

Union Electric Co. of Missouri
Meramec Station
Venice Station

Virginia Electric Power Co.
Chesterfield Station

West Penn Power Co.
Springdale Station

"UTILISCOPE" REGISTERED U. S. PATENT OFFICE

***Repeat orders have been received from these utilities.**

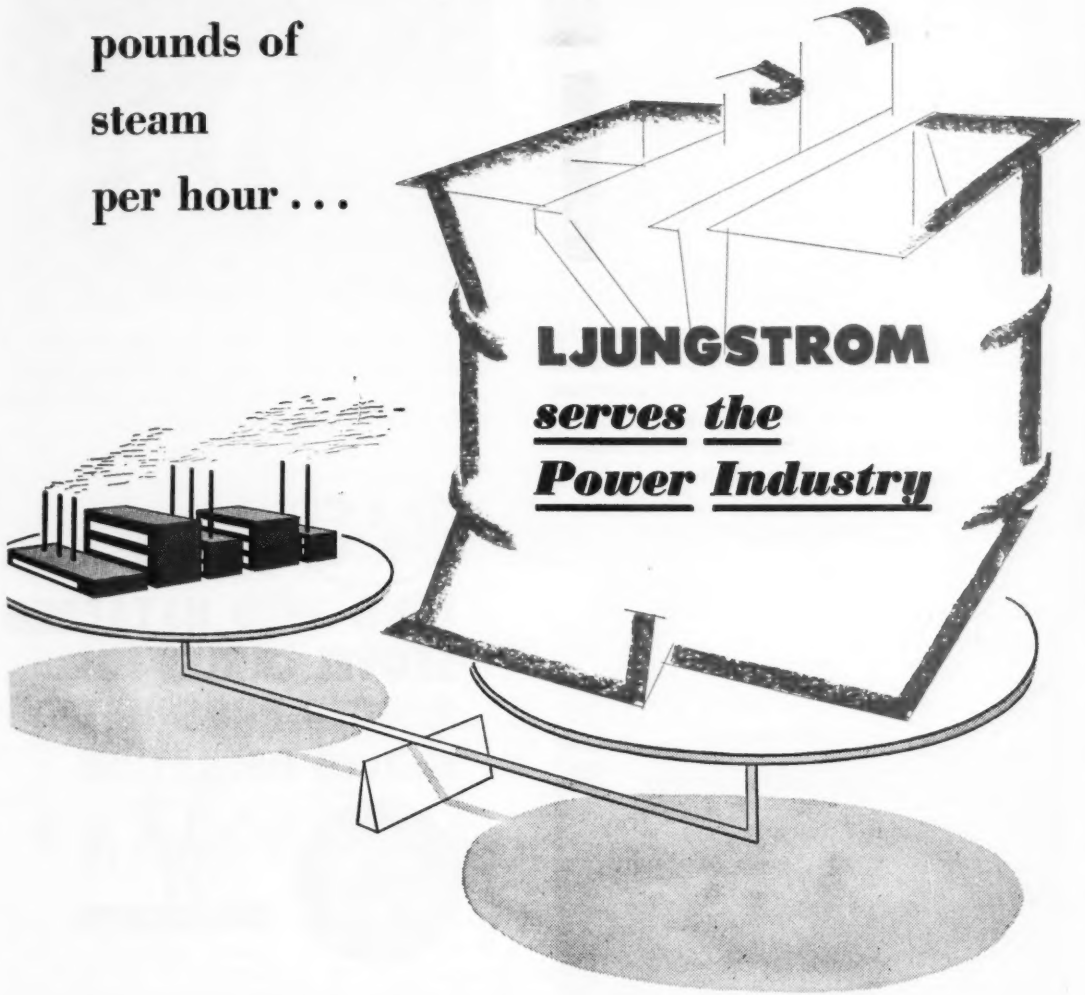
6303

50th ANNIVERSARY 1903-1953

DIAMOND POWER SPECIALTY CORP.
FIRST IN INDUSTRIAL TELEVISION
LANCASTER, OHIO • OFFICES IN 39 PRINCIPAL CITIES
Diamond Specialty Limited—Windsor, Ontario

347,000,000

pounds of steam per hour . . .



In the post-war rush to expand power generating facilities, utilities have not lost sight of the need for *operating economy.* Increasingly over these years, the fuel-saving, performance-improving potentials of the Ljungstrom Air Preheater have been realized – until today, nearly two out of every three power boilers are ordered with the specification "Ljungstom Air Preheater."

Since 1946 alone, in fact, more than 347,000,000 pounds per hour of steam capacity – installed or on order – have been designed for Ljungstrom.

This record speaks for itself. It proves that the Ljungstrom Air Preheater is, indeed, *the most economical heating surface in the modern boiler.*

The AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

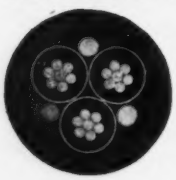
Underwater operation holds no peril for these Hazacord cables. Skid mounted junction box contains four 400 amp. circuit breakers . . . single cable leads from transformer bank; four branch circuits go to the control house near the shovel (below). The 500 horsepower motor which operates the pit-pump used for pumping the phosphate-bearing matrix to the washer also gets its power through Hazacords.

Grabbing 17 yards of phosphate rock in a single bite, this enormous dragline supplies raw material for fertilizers and chemicals produced by the Virginia-Carolina Chemical Corporation. Power is furnished by thousands of feet of Type SH-D, 5000-volt Hazacord cable.

Hazard's exclusive ZBF sheath—cured under pressure in a continuous metal mold—is one reason why Hazacord cable can take the rough treatment it gets being dragged over this rugged Florida terrain.

V-C CHEMICALS SELECTS

LONG-LIVED HAZACORD SHOVEL CABLES FOR RUGGED PHOSPHATE MINING OPERATION

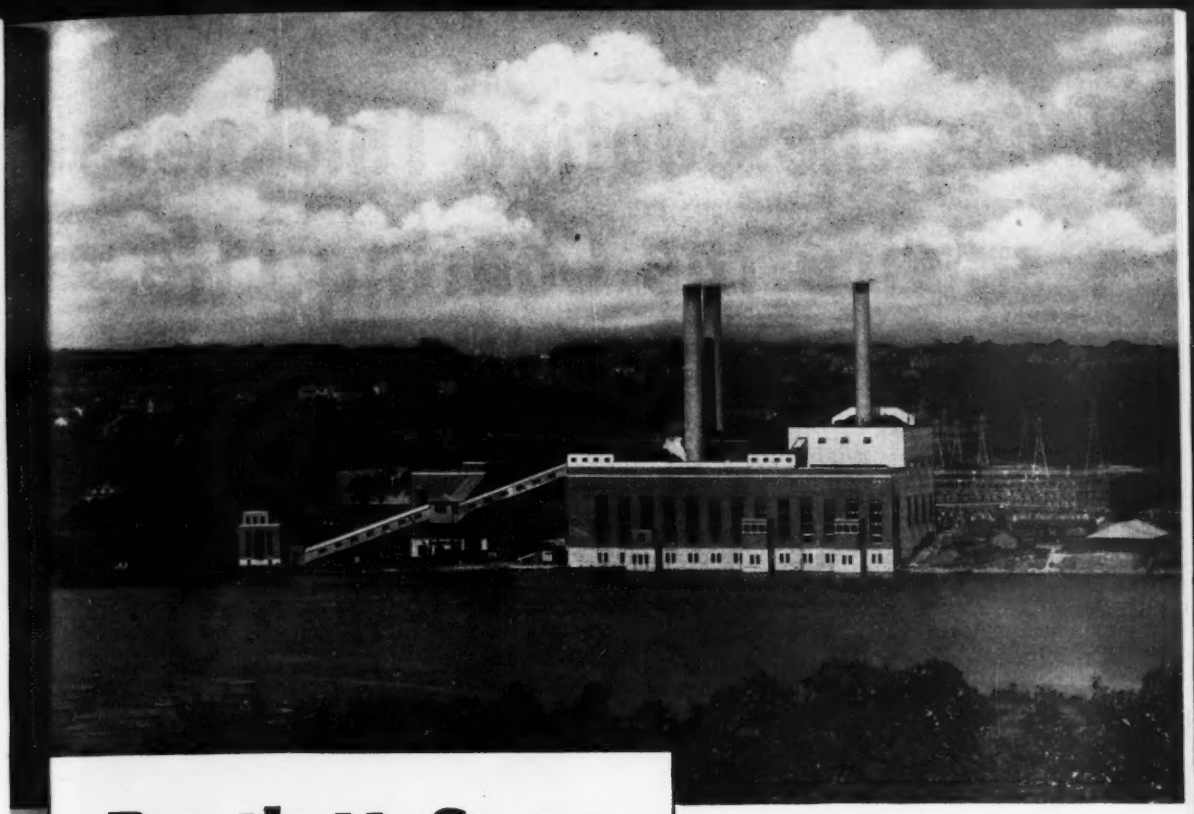


Hazacord Type SH-D was used exclusively by V-C for this important mining job. The safest and most widely used type for high-voltage work, Hazacord Type SH-D has copper shielding braid over each insulated conductor . . . grounding conductors in the interstices. For use up to 15000 volts.

On *every* job . . . from a giant dragline to a portable electric saw, Hazacords are setting new standards for long, economical service from cords and cables. Get complete information from your Hazard representative, your jobber or write to us today. Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pennsylvania.

HAZACORD *Mold-Cured* ***portable cables***

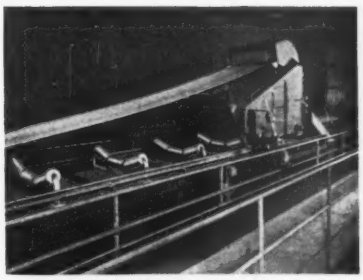
1403



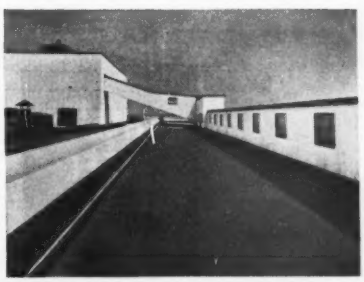
General View of Somerset Station
Montaup Electric Company
Stone and Webster Engineering Corp.
Consulting Engineers

Bartlett-Snow coal handling at Montaup

● The illustration above shows the Montaup Electric Company's Somerset Station after completion of a 60,000 K.W. extension that increased the total capacity of the plant to 210,000 K.W. The new coal handling equipment required — built and installed by Bartlett-Snow to Stone and Webster specifications — includes conveyors, weightometer and tripper. It connects into the old system at the south end of the plant, and is carried through a gallery built on the roof to discharge coal into the new bunker at the north end of the plant. For new plant projects, modernization programs, and additions and extensions to existing facilities, call the Bartlett-Snow coal handling engineers.



Bartlett-Snow Belt Conveyor Tripper
Over New Bunker



View of New Belt Conveyor Gallery
Built on Roof

DESIGNERS ENGINEERS

BARTLETT-SNOW
CLEVELAND 5, OHIO

FABRICATORS ERECTORS

"Builders of Equipment for People You Know"

Twice the Coating Thickness ...Twice the Coating Life

Take a careful look at these two pictures. One shows Bethanized strand with an electrolytic A coating (equivalent in weight to extra-galvanized). The second picture, also Bethanized strand, shows the B coating, which is just twice as thick.

Under like conditions, the B will last twice as long as the A—yet the extra cost is very small indeed. So, in many cases, it's plain common sense to select the heavier coating—for instance, where line structures will outlast strand with the A coating.

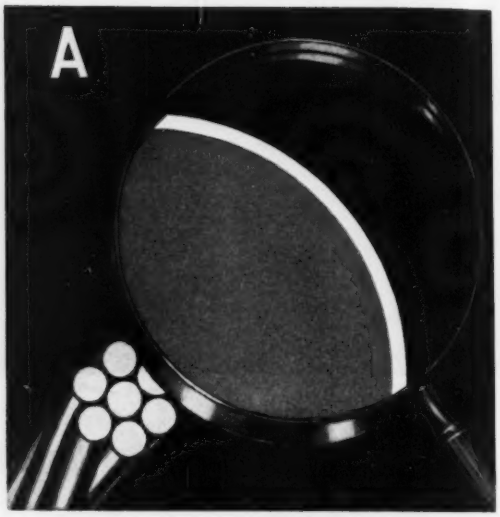
Naturally, there are installations where the A is highly satisfactory. It has its place. But where the A coating cannot be expected to last as long as the other line components, strand with the B coating is far more economical.

Moreover, Bethanized strand comes with a still heavier coating—called C—for extreme conditions. Thus, when you select Bethanized strand, armored with the pure, electrolytic zinc jacket, you can match strand life to the life expectancy of poles, towers, and other structural units.

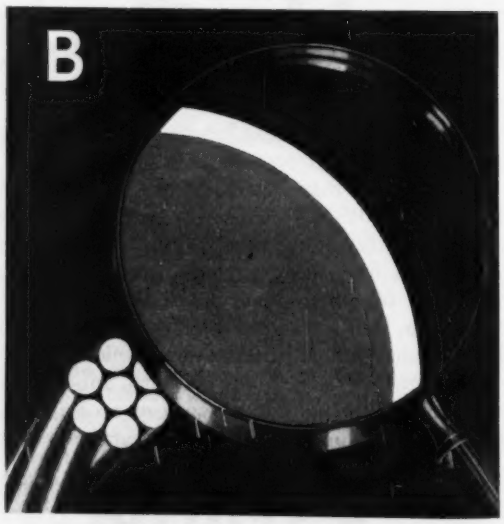
Bethlehem will be glad to give you the full story at any time. Ask our representative to call when it is most convenient for you.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation



Coating A (magnified)



Coating B (magnified)

★ BETHLEHEM STEEL ★

BETHANIZED STRAND

MIDWEST
PREFABRICATED PIPING

SAVES LABOR

SAVES TIME

SAVES MONEY

SAVES TROUBLE

From A Simple Bend

Or Welded Assembly

To Complete Piping Systems For Power Plant

Or Process *Call On MIDWEST*

Midwest Shop-Fabricated Piping saves labor, time, money and trouble in erection. Subassemblies are always practical, with the difficult operations performed in the fabricating plant. Field welding is simplified as much as possible. All pieces are accurate in alignment and dimension . . . they are thoroughly cleaned to remove all scale and dirt . . . carefully inspected and tested . . . stress relieved when necessary . . . ready to erect quickly, easily at lowest cost. It is to your advantage to use Piping Prefabricated by Midwest.

MIDWEST PIPING SERVICE IS NATION-WIDE

4 Plants Are Better Than 1

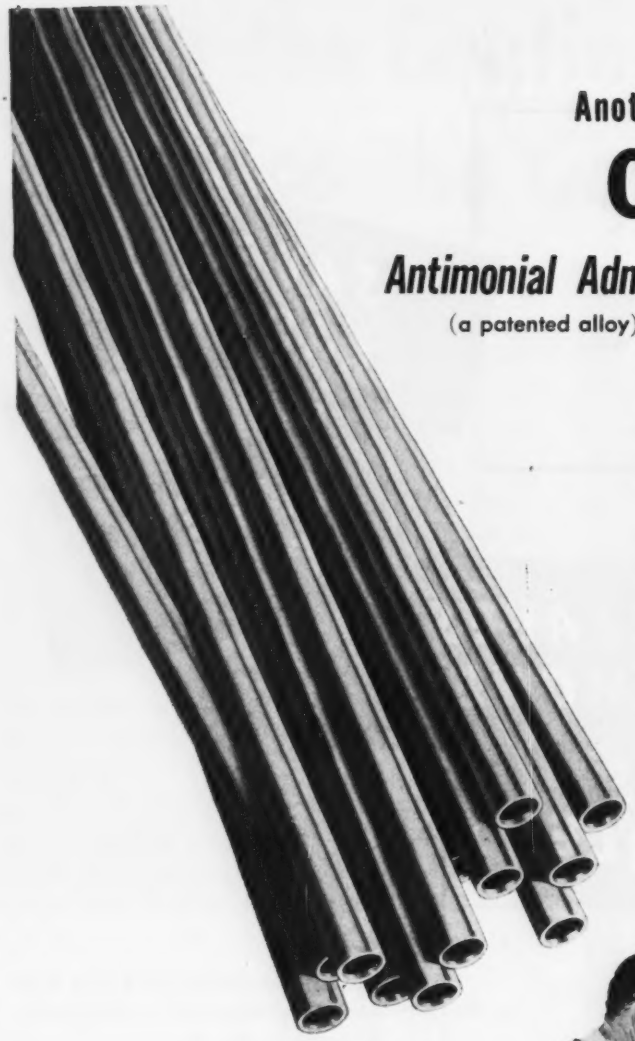
PIPING FABRICATORS AND CONTRACTORS

MIDWEST PIPING COMPANY, INC.

Main Office: 1450 South Second Street, St. Louis 4, Mo.

Plants: St. Louis, Passaic, Los Angeles and Boston

Sales Offices: New York 7—50 Church St. • Chicago 3—79 West Monroe St.
Los Angeles 33—520 Anderson St. • Houston 2—1213 Capitol Ave.
Tulsa 3—224 Wright Bldg. • Boston 27—426 First St.



Another reason why

Chase

Antimonial Admiralty Tubes last longer!*

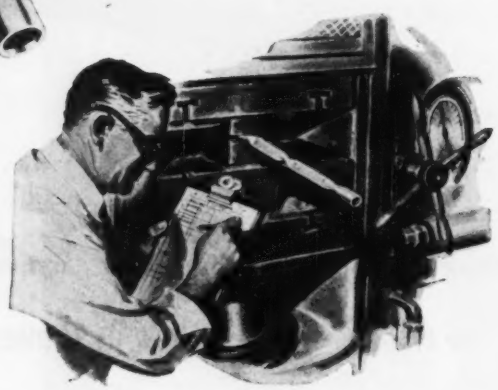
(a patented alloy)

Yes, you can *count* on Chase Antimonial Admiralty Condenser Tubes to give you many years of satisfactory service.

Chase Condenser Tubes are rigidly controlled for quality during manufacture, and various tests are applied when the tube is finished. The flattening test mentioned below is a good example. Wall thickness, diameter, surface finish, concentricity and accuracy of length are carefully determined.

So, for condenser tubes that last and last, *remember:* insist on Chase Antimonial Admiralty!

*U.S. Pat. No. 2,061,921



PUTTING THE SQUEEZE ON IMPERFECTIONS...
This Chase technician is performing a "flattening test" which is an indication of soundness and freedom from hidden defects. You are assured that tubes passing this test will satisfactorily withstand bending or end flaring.

PROMPT SHIPMENTS
from our mills in Cleveland and Waterbury.

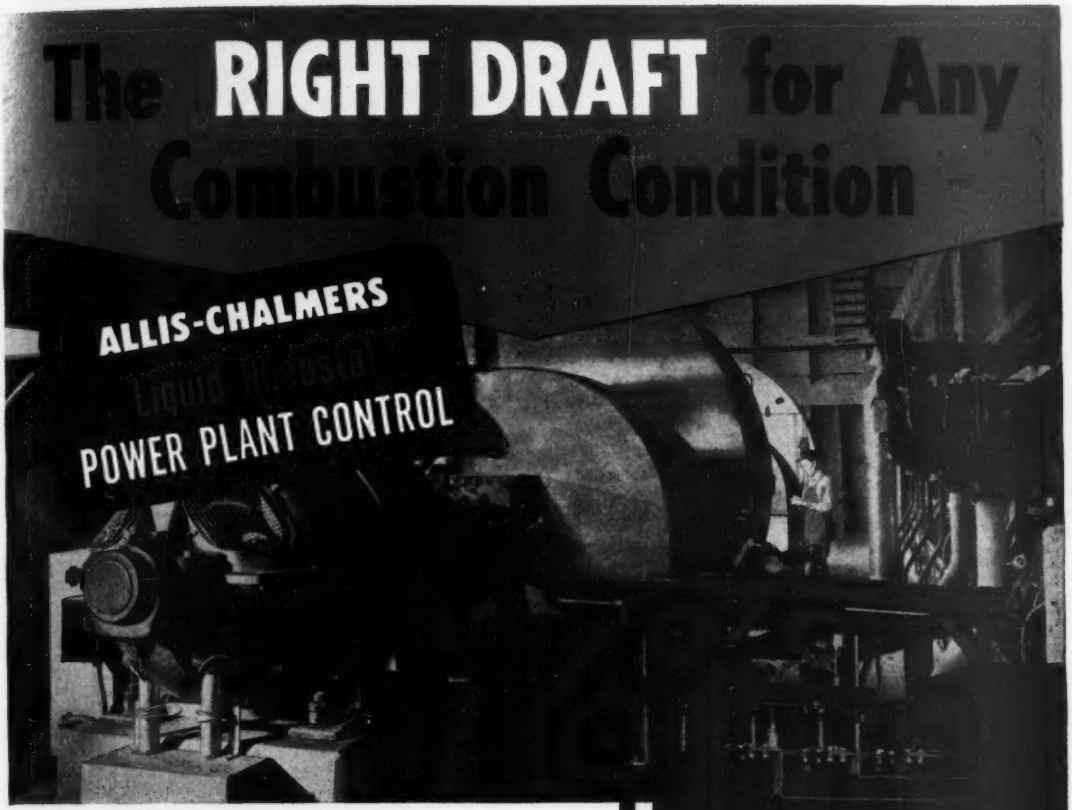
Chase BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass & Copper

Albany†	Cleveland	Kansas City, Mo.	New York	San Francisco
Atlanta	Dallas	Los Angeles	Philadelphia	Seattle
Baltimore	Denver†	Milwaukee	Pittsburgh	Waterbury
Boston	Detroit	Minneapolis	Providence	
Chicago	Houston	Newark	Rochester†	(†sales office only)
Cincinnati	Indianapolis	New Orleans	St. Louis	

The RIGHT DRAFT for Any Combustion Condition



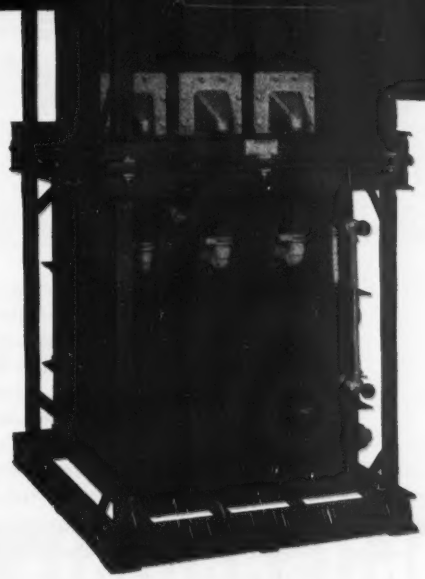
...Stepless, Wide Range Speed Control of Direct Coupled Draft Fans

When Type 257 Liquid Rheostats control the speed of boiler fans driven by wound rotor motors you get:

- Immediate response to varying draft conditions.
- Smooth, continuous, *stepless* speed control.
- Equal sensitivity over the entire operating range.

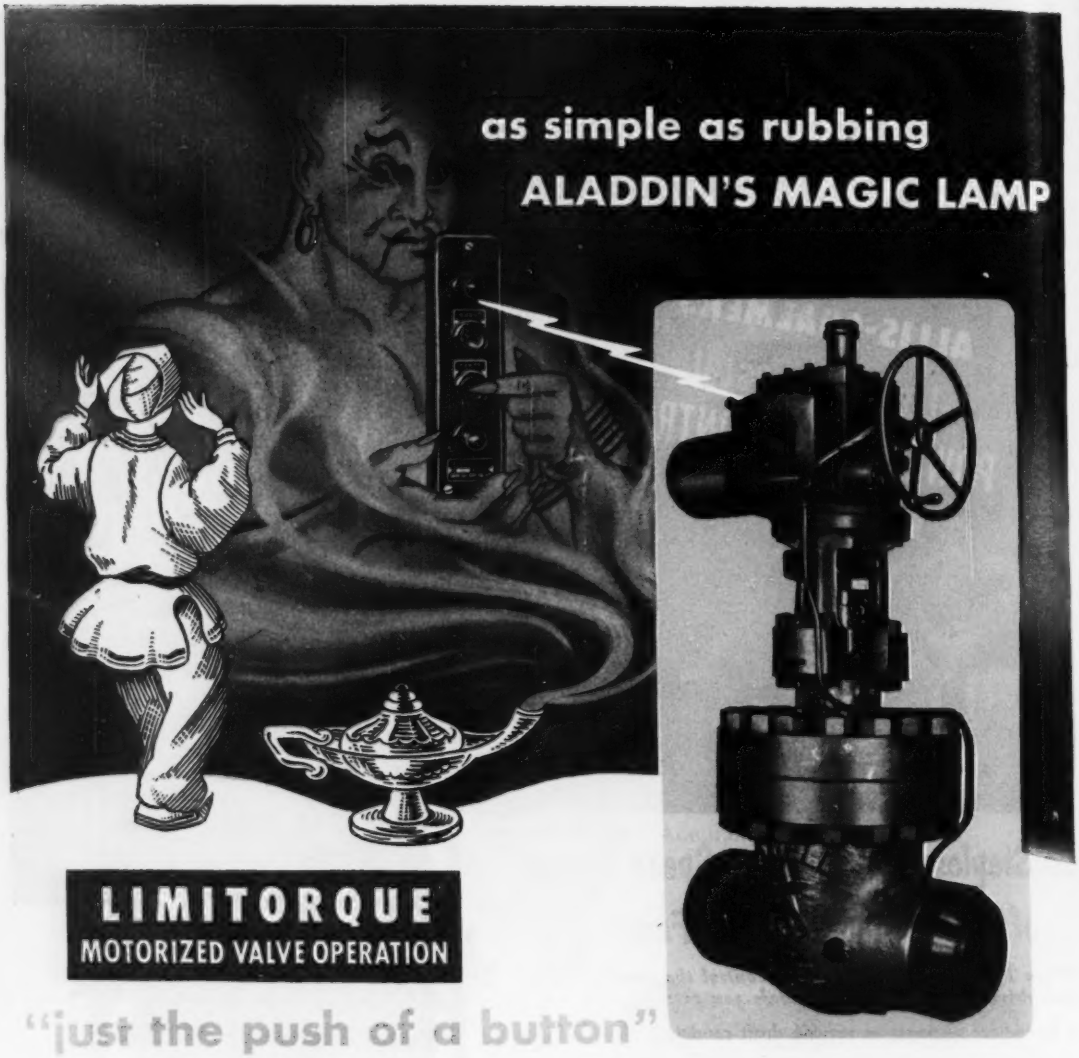
HOW IT WORKS. Motor speed is varied by increasing and decreasing resistance. This is accomplished by raising and lowering electrodes and the level of current-carrying electrolyte. A pilot device transmits draft condition to a lifting mechanism which controls electrode position and electrolyte level. A full resistance range is provided in only 10 inches of electrode travel. The basic principle of liquid rheostat operation plus the utilization of specially engineered electrodes gives a linear relationship between motor speed and electrode travel over the complete rheostat range.

Since the rheostat is not mechanically connected to the motor it may be located to suit the most convenient plant layout. For complete details, contact your Allis-Chalmers representative or write for leaflet 14S7544. A-4066



ALLIS-CHALMERS

Milwaukee 1, Wisconsin



LIMITORQUE
MOTORIZED VALVE OPERATION

"just the push of a button"

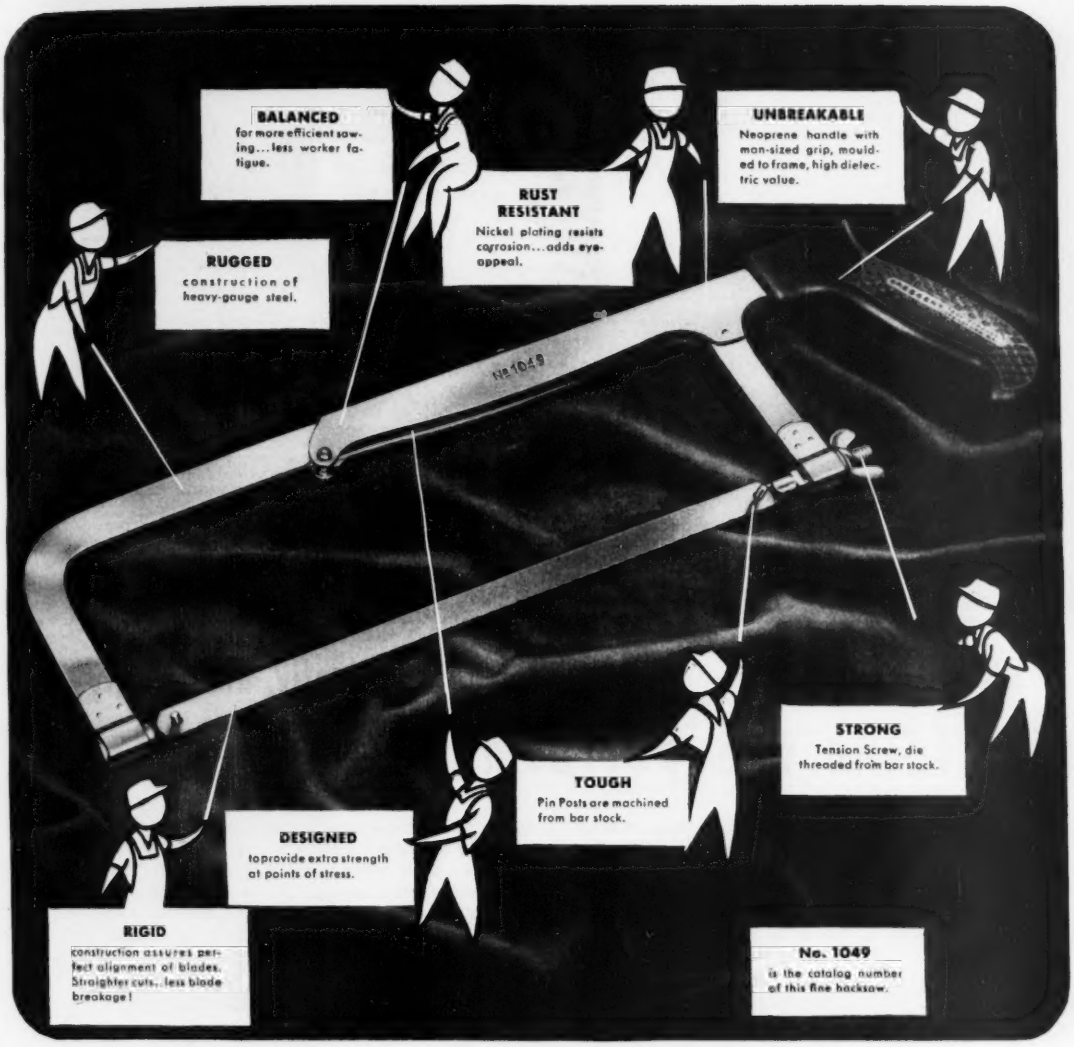
Hardly less magical than the rubbing of a lamp, accompanied by a few mysterious incantations—is the opening and closing of huge valves under high pressures, in remote places, or even miles away—by the MERE PUSH OF A BUTTON. Yet, that is the magic of *Limitorque* Valve Operation—safe, sure, dependable, accurate—and without the possibility of any damage to valve stem, seat, or disc.

Limitorque, is truly Valve Operation Magic—and that is why far more *Limitorque* Valve Operators are used today, than all others combined. Be convinced, send for our latest catalog L-50.

Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK · PITTSBURGH · CHICAGO · HOUSTON · LYNCHBURG, VA.

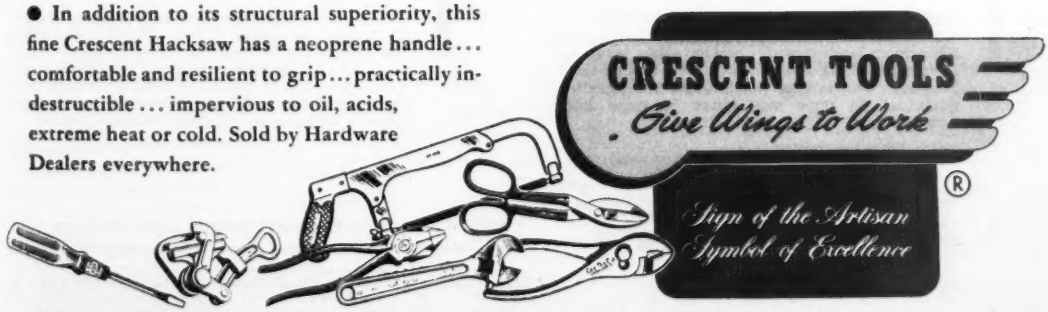
Industrial Gears and Speed Reducers
LimiTorque Valve Controls


BALANCED
for more efficient sawing... less worker fatigue.
RUST RESISTANT
Nickel plating resists corrosion... adds eye-appeal.
UNBREAKABLE
Neoprene handle with man-sized grip, moulded to frame, high dielectric value.
RUGGED
construction of heavy-gauge steel.
No. 1049
STRONG
Tension Screw, die threaded from bar stock.
TOUGH
Pin Posts are machined from bar stock.
DESIGNED
to provide extra strength at points of stress.
RIGID
construction assures perfect alignment of blades. Straighter cuts, less blade breakage!
No. 1049
is the catalog number of this fine hacksaw.

These eight features make Crescent's No. 1049

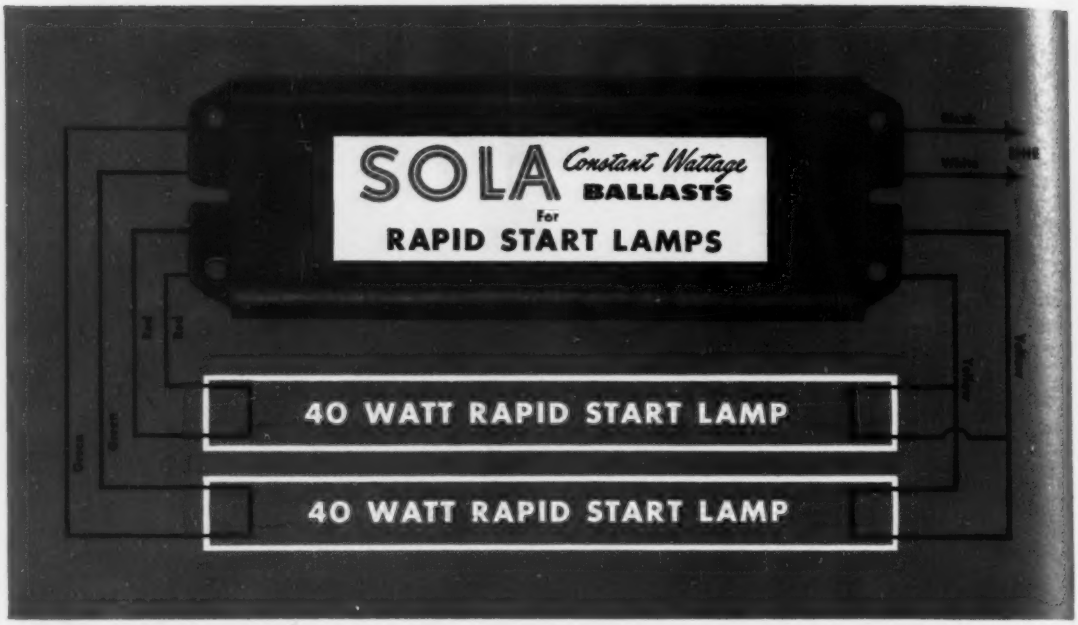
A BETTER HACKSAW

● In addition to its structural superiority, this fine Crescent Hacksaw has a neoprene handle... comfortable and resilient to grip... practically indestructible... impervious to oil, acids, extreme heat or cold. Sold by Hardware Dealers everywhere.



Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK



Here is *the lighting system* that automatically, unfailingly maintains the performance you specify

The rapid start lamp and the Sola Constant Wattage Ballast together form the heart of an entirely new fluorescent lighting system. All the inherent advantages of the rapid start lamp are enhanced when operated from a Sola Constant Wattage Ballast regardless of line voltage conditions. This is the finest ballast that Sola Electric Co. engineers have ever created, and they have introduced a notable number of ballast "firsts." Here is a unique lighting system resulting in performance that is unsurpassed from any point of view. Check the list below. Compare and you will specify Sola Constant Wattage Ballasts for your rapid start lamp installations.

USERS:

Accelerated life tests indicate exceptionally long lamp life relatively unaffected by the number of starts . . . radio interference suppressed . . . completely safe during lamp changes . . . unusually quiet . . . positive light upon closing switch.

ARCHITECTS:

Constant light output within ±2.5%, with line voltage variations as great as ±10% . . . cooler operation (average heat rise 50°C) for reduced air conditioning load . . . UL listed . . . meets proposed Certified Ballast Manufacturer's specifications and every suggested requirement of major lamp manufacturers.

FIXTURE MANUFACTURERS:

Lower initial costs compared with instant start . . . simplified wiring . . . permits use of conventional bi-pin lamp holders with absolute safety since the circuit of the ballast is self protecting against shock hazard . . . series type circuit which has been recommended for rapid start lamps by major lamp manufacturers.

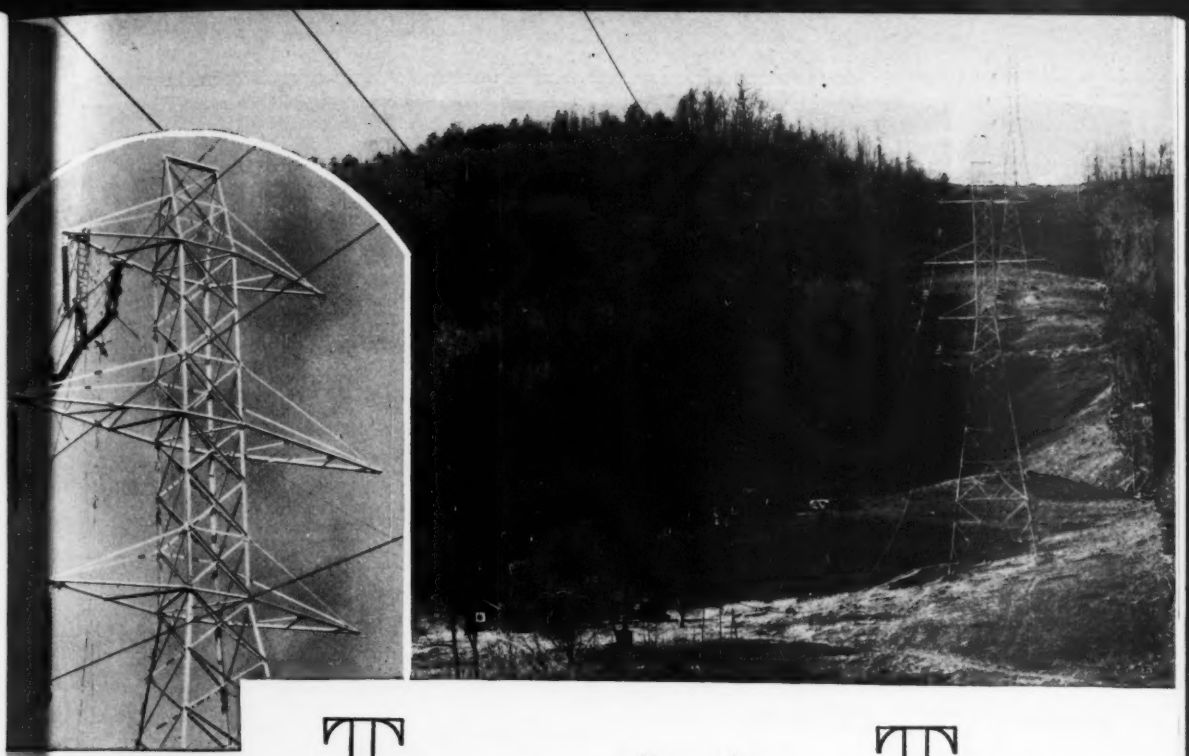
CONTRACTORS:

Only two wires, directly from the ballast, to connect on the line, no wiring to lamp sockets . . . ballast has extremely long life since it is very cool in operation . . . self protecting under abnormal conditions, when lamp failure occurs the ballast actually runs cooler, not hotter . . . gives your customer *all* the light he pays for because of constant wattage feature.

SOLA *Fluorescent* **BALLASTS**

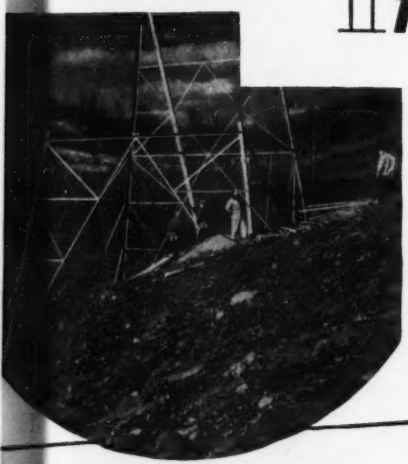
WRITE FOR RAPID START BALLAST BULLETIN Z-PFL-167. If you want more information, write or phone the nearest Sola office listed below.

Transformers for Constant Voltage • Fluorescent Lighting • Cold Cathode Lighting • Mercury Vapor Lighting • Luminous Tube Signs
SOLA ELECTRIC CO., 4633 W. 16th Street, Chicago 50, Illinois, Bishop 2-1414 • NEW YORK 35: 103 E. 125th St., TRafalgar 6-6464
PHILADELPHIA: Commercial Trust Bldg., Rittenhouse 6-4988 • BOSTON: 272 Centre St., Newton 58, Mass., Bigelow 4-3354
CLEVELAND 15: 1836 Euclid Ave., PRospect 1-6400 • KANSAS CITY 2, MO.: 406 W. 34th St., Jefferson 4382 • Representatives in Principal Cities



Transmission Towers

designed to carry any load ...to fit any terrain!



Recent high voltage line towers by AMERICAN BRIDGE

Appalachian Electric Power Co.
Ohio Power Company
Public Service Company of Indiana
Duquesne Light Company
Dayton Power and Light Company
Cincinnati Gas & Electric Company
Detroit Edison Company
Toledo Edison Company
Idaho Power Company
Indiana & Michigan Electric Co.

AMERICAN BRIDGE steel towers carry many thousands of circuit-miles of transmission lines across this great land. Scaling the heights of rugged mountains; through marshy lowlands, traversing every conceivable kind of terrain, these steel transmission towers are helping make America's great power distribution system the world's best.

American Bridge towers are made to order for every type of transmission line service. They are designed for simplified erection on level, side-hill, or rocky butte sites. They are engineered for heavy-duty service under the severest climatic conditions.

Incorporating special design features such as steel grillage earth anchors and variable leg extensions, American Bridge towers make possible important savings in time, labor, and material costs.

The technical knowledge and experience American Bridge has acquired in more than fifty years of designing, fabricating and erecting towers may be just the answer to your problems. Our engineers welcome an opportunity to figure on your requirements. Just write our nearest office.

AMERICAN BRIDGE DIVISION, UNITED STATES STEEL CORPORATION
GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.

Contracting Offices in: AMBRIDGE · ATLANTA · BALTIMORE · BIRMINGHAM · BOSTON · CHICAGO
CINCINNATI · CLEVELAND · DALLAS · DENVER · DETROIT · DULUTH · ELMIRA · GARY · MEMPHIS
MINNEAPOLIS · NEW YORK · PHILADELPHIA · PITTSBURGH · PORTLAND, ORE. · ROANOKE · ST. LOUIS
SAN FRANCISCO · TRENTON UNITED STATES STEEL EXPORT COMPANY, NEW YORK

AMERICAN BRIDGE

USS

UNITED STATES STEEL

PROVED

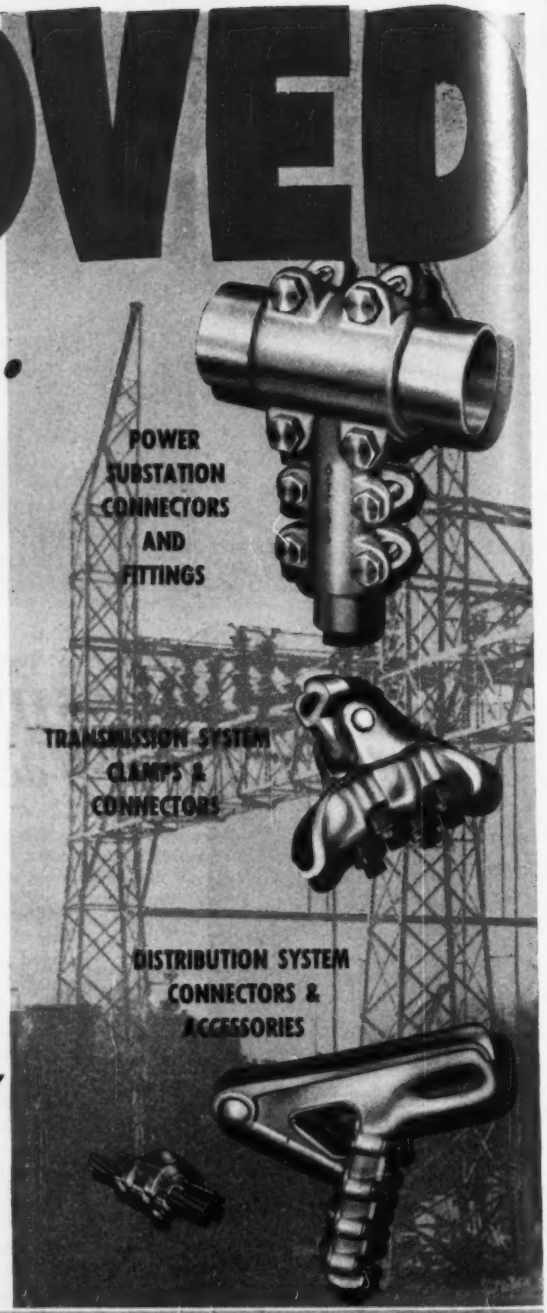
on the job...

ANDERSON

Aluminum

CONNECTORS, CLAMPS, FITTINGS & ACCESSORIES

- MAXIMUM EFFICIENCY
- LONGER LIFE
- EASIER INSTALLATION


POWER SUBSTATION CONNECTORS AND FITTINGS
TRANSMISSION SYSTEM CLAMPS & CONNECTORS
DISTRIBUTION SYSTEM CONNECTORS & ACCESSORIES

Anderson cast aluminum electrical products are specially designed for *increased conductor life, minimum power loss, and easier handling*. Every safety factor has been carefully engineered into these superior electrical products . . . they're made to withstand extreme loading, sudden shock and stress reversals far in excess of established standards.

ABW DESIGN MEANS QUALITY *Plus* STRENGTH IN THE RIGHT PLACES

For complete information, consult one of our nearest 19 representatives . . . or contact our main office.

Aluminum and Bronze POWER CONNECTORS • CLAMPS • FITTINGS *and* ACCESSORIES *for*

SUBSTATION — TRANSMISSION — DISTRIBUTION

ABW

ANDERSON BRASS WORKS
INCORPORATED
BIRMINGHAM 1, [illegible] ALABAMA

FRANK NEWCOMBE, *President*
Central Transformer Corp.

"TRANSFORMERS? ...I pledge you the very highest standard of excellence, in Central!"

"It's natural for every manufacturer to brag about his product, but conscientiously, I don't see how better transformers could possibly be made, than we're making here at Central.

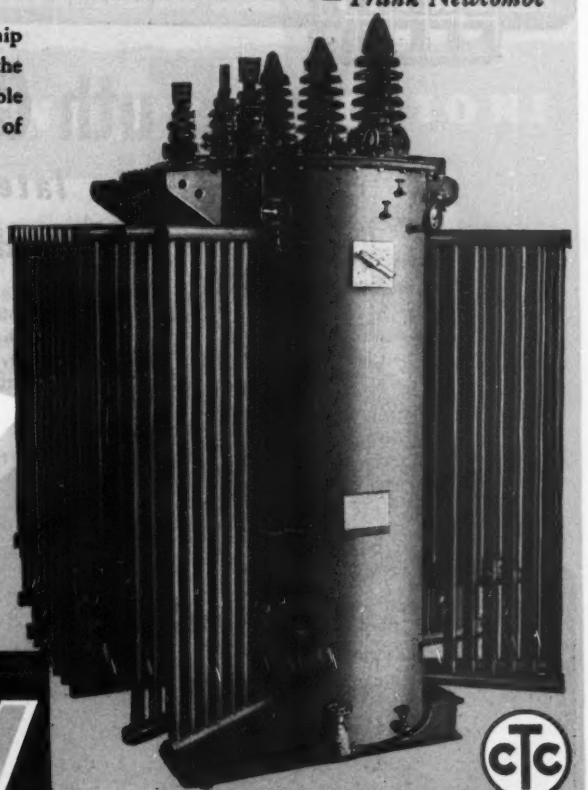
"I know that skilled, experienced workmanship goes into every operation, and I know that the finished product must be a thoroughly dependable one, because hundreds of users have told us of Central's trouble-free performance and minimum maintenance. I earnestly hope your next transformer will be a Central."

— Frank Newcombe

A type for every need...

Transformers in sizes from 3 KVA to 10,000 KVA, up to 115 KV primary class.

Photo at right shows a 3000 KVA, 3 Phase OISC, 46 KV Primary.



Central
TRANSFORMER CORP.

CTC

PINE BLUFF, ARKANSAS
SALES OFFICES IN PRINCIPAL CITIES

new

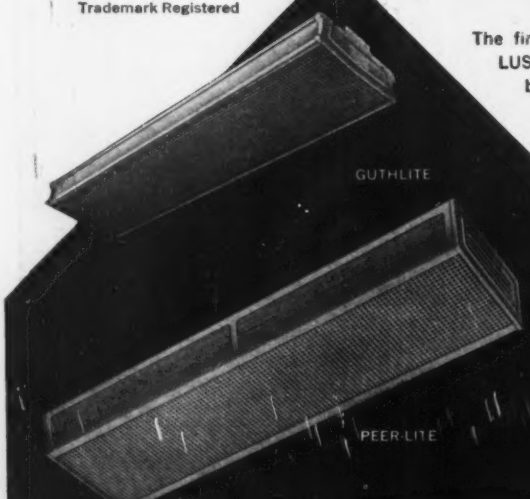
OPEN LIKE A LATTICE
DIFFUSING LIKE GLASS

Guth GrateLite* Louver

the latest idea in lighting

A SYMPHONY OF DIFFUSED LIGHT

* U.S. & Can. Pats. Pend.
Trademark Registered



The first integral plastic louver for fluorescent lighting, molded of LUSTREX polystyrene. It reveals a new conception of architectural beauty and efficient lighting: Its diffusion results from the ⅜" cubical lattice that cuts off direct light at a 45° angle.

But words alone cannot describe beauty. See for yourself and ask to be shown a sample. It will give you a new outlook on lighting.

GrateLite is tough, quickly cleaned and de-staticized. It is furnished in one piece with Guth Fluorescent Fixtures.

Write today on your letterhead for complete information.

LEADERS IN LIGHTING

Guth

SINCE 1902

THE EDWIN F. GUTH COMPANY · ST. LOUIS 3, MO.

BLACKBURN *Copper-Bonded* GROUND ROD

the Underground Story . . .

. . . ON LASTING PROTECTION!

It's completely covered with a heavy copper sheath, molecularly bonded to the steel core for permanent protection.

It has an extra-rigid, strong steel core which will not bend on driving.

Its copper sheath is cold-rolled, hard, and scar-resisting, for driving in rocky soil.

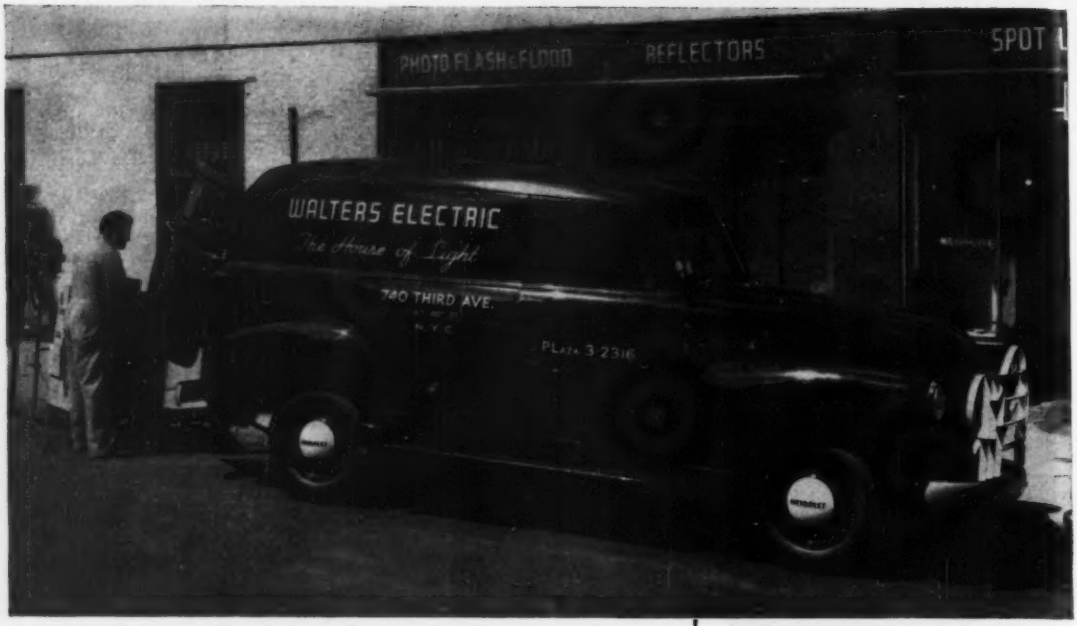
It's produced in the middle west, strategically located for quick delivery to all parts of the United States.

Stocked by Leading Wholesalers

JASPER BLACKBURN CORPORATION

35 Madison St., St. Louis 6, Missouri Phone CEntral 3007

Distributed on the West Coast by KORTICK Mfg. Co.



4 Powerful Reasons why costs go down with CHEVROLET ADVANCE-DESIGN TRUCKS on the job

EXTRA POWER WITH ECONOMY! More hauling power, greater economy! That's the result of new 7.1 to 1 compression ratio of improved Loadmaster engine on 5000 and 6000 Series heavy-duty and forward control models—optional on 4000 Series heavy-duty trucks. Thriftmaster engine in light- and medium-duty models provides traditional Chevrolet economy.

ENGINEERED FOR THE JOB! With Chevrolet, you buy a truck that is exactly right for the job. Not too big. Not too small. You get a truck engineered from the ground up with your job in mind—with the right tires, springs, axle, clutch and engine. You get a truck that will stick on the job day after day, and do your work at lowest cost.

BUILT TO LAST! The extra-sturdy construction of Chevrolet advance-design trucks means longer life, even lower costs. Now, Chevrolet trucks are brawnier than before—with heavier, more rigid frames, with greater ruggedness and stamina built right in. These are the toughest and the sturdiest Chevrolets ever.

THE LINE LISTS FOR LESS, TOO! With all the solid superiorities that Chevrolet offers—with all their special features and advantages—this great line of haulers lists for less than any other trucks of comparable size and specifications. See your Chevrolet dealer. Chevrolet Division of General Motors, Detroit 2, Michigan.

CHEVROLET ADVANCE-DESIGN TRUCK FEATURES

TWO GREAT VALVE-IN-HEAD ENGINES—the Loadmaster or the Thriftmaster—to give you greater power per gallon, lower cost per load. **POWER-JET CARBURETOR**—for smooth, quick acceleration response. **DIAPHRAGM SPRING CLUTCH**—for easy-action engagement. **SYNCHRO-MESH TRANSMISSION**—for fast, smooth shifting. **HYPOID REAR AXLE**—for dependability and long life. **TORQUE-ACTION BRAKES**—on light-duty and medium-duty models and on front of heavy-duty models. **TWIN-ACTION REAR BRAKES**—on heavy-duty models. **DUAL-SHOE PARKING BRAKE**—for greater holding ability on heavy-duty models. **CAB SEAT**—with double deck springs for complete riding comfort. **VENTIPANES**—for improved cab ventilation. **WIDE-BASE WHEELS**—for increased tire mileage. **BALL-GEAR STEERING**—for easier handling. **UNIT-DESIGNED BODIES**—for greater load protection. **ADVANCE-DESIGN STYLING**—for increased comfort and modern appearance.

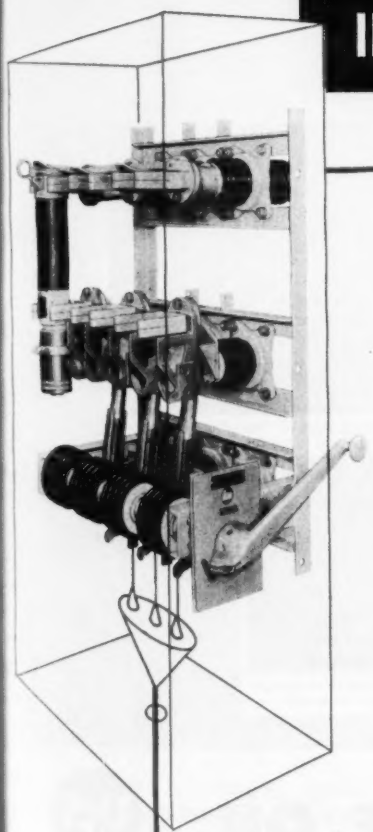
CHEVROLET
first in demand in value in sales

...crease SAFETY FACTORS on important load centers

Check the Facts

1. Mounts anywhere—wall, transformer throat, etc.
2. Load interruption always assured.
3. Proper operating procedure guaranteed by sequencing device on operating handle.
4. Provision for key or solenoid type interlock.
5. Any desired fuse and switch arrangement possible.
6. Supplied with or without housing—door interlocks optional.

SAFE-DEPENDABLE R&IE INTERRUPTER SWITCHES



INTERRUPTING ABILITY and OPERATING LIFE

The interrupting ability and operating life of an air interrupting switch is a function of the magnitude of current and voltage, interrupted, the interval between operations and the constants of the circuit being interrupted. For these reasons, the interrupting rating of such a switch cannot be expressed adequately by a single value of amperes or KVA, as is the common practice for circuit breakers and fuses, but must be expressed as a curve or tabulation of operating life at various currents under specified test conditions. The values applicable under one set of conditions may vary widely under another set of conditions. Under the conditions specified by NEMA, plunger type R&IE interrupter switches have the interrupting ability and operating life shown here.

AMPERES INTERRUPTED	NUMBER OF OPERATIONS
25	500
50	225
100	100
200	45
400	20
600	12
1200	5

For complete details send for Bulletin 1360-A.

R&IE INTERRUPTER SWITCH EQUIPMENT

DIVISION OF I-T-E CIRCUIT BREAKER CO.

GREENSBURG, PA.

The Check List

CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS

DISCONNECTING SWITCHES INDOOR AND OUTDOOR

HORN GAP SWITCHES

INTERRUPTER SWITCHES

CUTOUTS AND THERMO-RUPTERS

DISTRIBUTION EQUIPMENT

SWITCH OPERATING MECHANISMS

SUBSTATIONS

OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES

KIRK INTERLOCK SYSTEMS

AUTOMATIC SWITCHING EQUIPMENT

METAL CUBICLES

TESTING DEVICES

Still in service after 28 years* these Dayton Power & Light poles are protected by Creosote Oil

● Not a single failure due to decay—that's the record of 140 poles installed with Creosote Oil protection in 1925 by Dayton Power and Light Company on its Bloomingburg line near Washington Court House, Ohio.

Highway relocations and company developments requiring higher poles have led to removal of many of the poles, but all were reinstalled and are still in service.

Tests, including borings, were made in 1952 on several poles by the Company's Material Research Department. The poles were found to be tough, hard and difficult to bore; penetration at all points was still deep and the general condition of the poles was good.

* * *

This is the kind of service you can expect when your poles and crossarms are pressure-treated with Creosote Oil. And it is the reason why Creosote Oil is the most-used wood preservative.

For Creosote Oil that is always uniform in quality, ask your treater to use U·S·S Creosote Oil. For complete information, contact our nearest Coal Chemical sales office or write directly to United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

DATING NAIL on one of the poles indicates it was first put into service in 1925.

CLOSE-UP of one of the poles at the ground line showing its excellent condition.

PRESSURE-CREOSOTED southern yellow pine poles in the Bloomingburg line of Dayton Power and Light Company near Washington Court House, Ohio.

U·S·S CREOSOTE OIL

USS

UNITED STATES STEEL

3-1078

THE WESTINGHOUSE POTENTIAL COIL DESIGN

gives you longer meter life

The potential coil is a vulnerable spot in any meter. Westinghouse has engineered four separate coil refinements that give extra-long meter life. Thousands of these coils have been in service for over a year with no breakdowns reported.

No moisture danger . . . Moisture in a coil can cause insulation failure; so to keep it out, we've capped the coil ends and impregnated the coil with a special polyester resin.

One less soldered joint . . . and that means one less cause of trouble. Leads are now fastened directly to coil windings—solidly anchored and embedded in the insulating material.

No air bubbles . . . Coils are *vacuum impregnated.* All air bubbles, a possible cause of failure, are removed before the insulation is applied.

No insulation voids . . . Some impregnating resins shrink upon solidifying, leaving voids which can cause dielectric breakdowns. The new resin, Laminac, hardens without shrinkage, without leaving voids.

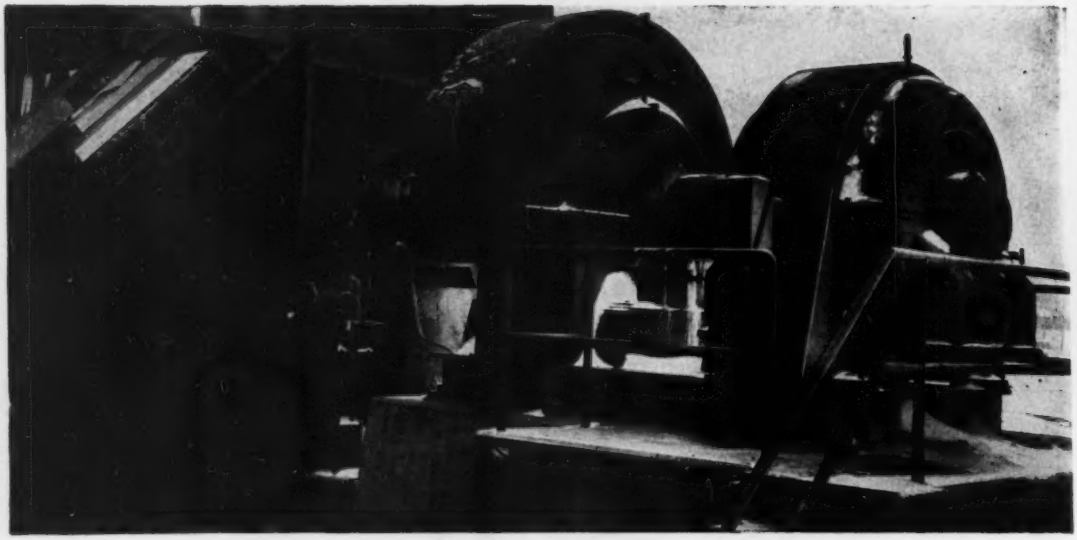
Get more information . . . This improved potential coil is one of several important refinements recently engineered into Westinghouse Meters. Write for, *What It Takes for Long-time, Low-cost Metering,* B-4665—an interesting, readable booklet. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-40443

Everything you need in meters and instruments

YOU CAN BE **SURE**...IF IT'S

Westinghouse



WHAT THE WELL DRESSED

magnetic drive

WEARS FOR OUTDOOR WORK...

Engineers inspect new Magnetic Amplifier Type E-M Regutron Control for Magnetic Drive installations similar to above. This new simplified control has no complicated electronic circuits to adjust . . . no tubes to wear out. A simple saturable core reactor amplifier system accomplishes the precise control of speed. Full information is given in Publication No. 1107 . . . sent on request.

● With building costs skyrocketing and inside floor space at a premium, a current trend in modern power plants is toward outdoor installation of equipment.

The E-M Magnetic Drive with outdoor enclosure, above, provides precise speed control for induced draft fans at The Dayton Power and Light Company, Dayton, Ohio. The Drive is dressed up in E-M's specially designed steel overcoat for weather protection. This welded steel plate enclosure has a rust resistant undercoating and is split in two sections for easy removal.

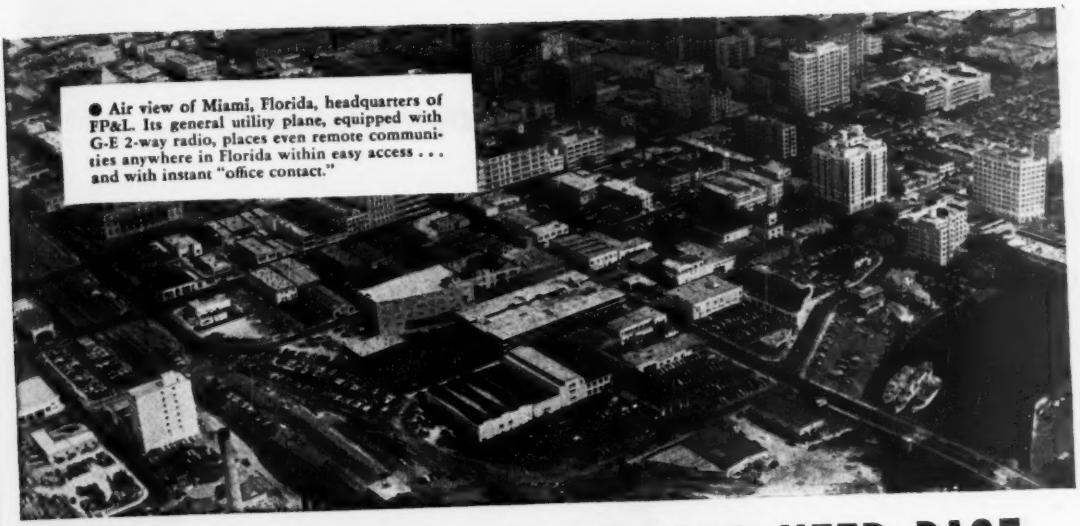
Ventilating air for the Magnetic Drive is taken in through a duct in the foundation and is discharged at the side of the enclosure . . . removable filters keep dirt and trash out. Volute contour of the enclosure is designed for proper, adequate ventilation.

The E-M Magnetic Drive, an electro-magnetic torque transmitting device, is designed to provide variable speed control of driven machines from a constant speed a.c. motor. This adjustable speed plus a.c. economy is your best answer to efficient operation of boiler draft fans. And if you're planning your installation for outdoors, remember that E-M offers the effective protection described above.

Your nearest E-M sales engineer will be glad to advise or assist you in any stage of planning . . . call him or write the factory for Publication No. 1107.

ELECTRIC MACHINERY MFG. COMPANY
MINNEAPOLIS 13, MINNESOTA

4400-TPA-3103



● Air view of Miami, Florida, headquarters of FP&L. Its general utility plane, equipped with G-E 2-way radio, places even remote communities anywhere in Florida within easy access . . . and with instant "office contact."

G-E 2-WAY RADIO HELPS FP&L KEEP PACE WITH FAST GROWING FLORIDA

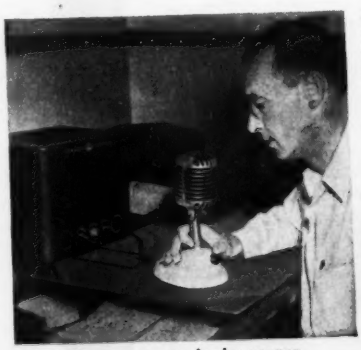
FIVE years ago, Florida Power & Light Co. called in G-E communications advisors to help plan a 2-way radio system which would incorporate an air-ground patrol of all facilities. Realizing the value of instant communications, FP&L took this step to increase the efficiency of a statewide mobile and base station network.

Indicative of Florida's rapid growth, FP&L has stepped up its generating capability 162% since V-J Day! Dependable communications are doubly important today. Air-ground contact with base and mobile units enables company officials to expedite routine jobs—save valuable time!

Today, Ken Shotwell, FP&L official, has this to say: "We rely on our G-E units. Instant communication with our offices increases the ability of our folks to get around the system more frequently. This makes for better operations, better human relations all around."

The CAS* man in a local G-E office can offer valuable advice concerning the specialized requirements of your communications problem. Consult him today or write: *General Electric Co., Section 1963-15, Electronics Park, Syracuse, N. Y.*

*Communications Advisory Service



● F. J. Norton, communications supervisor, relays instructions from a base station to a mobile repair truck. "Radio dispatching speeds service restoration, saves time and money. This kind of efficient operation helps utility companies keep electric rates low," he says.

● A line crew follows up report of broken insulators detected by air patrol . . . makes repairs before real damage develops. FP&L men refer to their 2-way radio system as the workhorse of the company.

● Ken Shotwell, assistant to the company vice president, checks flight plans with J. A. Majewski before departing from Miami's Tamiami Airport. Their General Electric 2-way radio will give instant communication with ground base stations and mobile units.

GENERAL ELECTRIC

For Years we have said,

"Connect to Copperweld Ground Rods"

Here's Why...

THEY'RE MOLTEN WELDED—Permanent interlocking weld between the copper and steel eliminates possibility of electrolytic action. No other ground rod has this inseparable union, accomplished only by the proved Copperweld* Molten-Welding process.

THEY'RE EASY TO INSTALL—Copperweld's extra-strong steel core assures rigidity and easy driving even through very hard soils.

THEY HAVE HIGH CONDUCTIVITY—Copperweld's thick sheath of pure copper provides excellent electrical conductance. Copper-to-copper contacts throughout insure low resistance.

THEY'RE PROTECTED AGAINST RUST—Copperweld's heavy copper armor permanently protects the alloy steel core against corrosion.

THEY PROVIDE GREATER ECONOMY—Longer service life with no maintenance costs.

THEY'RE PROVED IN SERVICE—Millions are in use protecting billions of dollars worth of equipment.

*Trade Mark

As each Copperweld Sectional Ground Rod is driven, the next rod is joined to it by means of a heavy bronze coupling, and the driving procedure is then repeated. It's as simple as that.

With this power driver, deep grounding is simple, quick and economical. You can readily duplicate this driving rig in your own shop. Write us for detailed plans.

Today we add,

"Drive Deeper for Better Grounding"

DEEP GROUNDING with Copperweld TRADE MARK SECTIONAL GROUND RODS

—the simple, low-cost method to get TOP PERFORMANCE AND SAFETY from your Protective Equipment

Today the Stakes are Higher

As you have improved your standards of service, your customers have come to depend more and more on an uninterrupted flow of electric current. This applies not only in urban areas but on your rural lines as well. The farmer with a thousand chicks under incubation is in the same vulnerable situation as the industrial user whose manufacturing process depends on continuity of electrical power.

Also, the cost of making a service call has increased, and so has the value of equipment which needs protection.

Protection Must Be Positive

You can rely on protective devices which, to function properly, must be connected to low-resistance grounds. This means that in grounding, you work to a standard of resistance, not to a standard of depth.

Deep Grounding is Proved and Practical

Whatever the grounding conditions along your lines, you must be prepared to cope with them. Deep grounding procedure is flexible. If one rod does not provide the required resistance, it is simple to go deeper with Copperweld Sectional Ground Rods. You drive only as many sections as you need to obtain the resistance that will give you utmost dependability from your protective equipment.

Remember, deep grounding is practical assurance of better line performance, fewer outages, and greater safety. Start this protective program now by using Copperweld Sectional Ground Rods.

THEY'RE MOLTEN-WELDED Copperweld GROUND RODS

COPPERWELD STEEL COMPANY
Glassport, Pa.
SALES OFFICES IN PRINCIPAL CITIES

Gas brazing equipment.

Induction brazing unit.

STOP
YOUR CONTACT TROUBLES
BEFORE THEY START

Not One...But Five!

All five types of brazing equipment are available at Mallory to meet your particular needs.

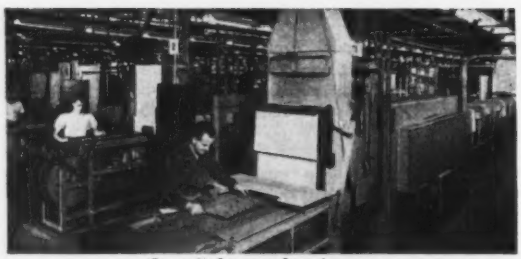
On even the simplest button or rivet contact, trouble can start with the wrong method of bonding. Size, shape, nature of the material, frequency and degree of impact, tooling costs and production quantities . . . all must be considered in selecting the one best method of brazing.

Mallory is equipped to make completely unbiased decisions in selecting the best and most economical brazing technique for any type of contact or contact assembly. Our plant is equipped with all five types of brazing equipment . . . as well as four types of resistance welding equipment. Facilities are available in the laboratory as well as on the production floor. Production techniques are worked out ahead of time . . . before production runs are started . . . so you can be sure of completely dependable contacts, economically produced.

This is only part of the story, however. If you want the rest of it, our engineers will be glad to send you complete information . . . or answer any questions you may have regarding the design and production of the contacts for your products.

Hand brazing with oxy-hydrogen torch.

Resistance brazing machines.



Controlled atmosphere furnaces.

Expect more...
Get more from **MALLORY**

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario

Electrical Contacts and Contact Assemblies

P.R.MALLORY & CO Inc.
MALLORY

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in 1908 Nichrome* made electric heat possible!

since then... The Standard of Quality for Electrical Alloys

When Driver-Harris introduced Nichrome* in 1908, *dependable* electric heat became possible for the first time. And with each passing year, Nichrome looms larger as the *ideal* alloy for producing electric heat in domestic and industrial equipment.

Its consistent dependability and unique performance have earned it a world-wide reputation—and made it *the* standard of quality for electrical alloys. That's why today, the great majority of heating elements of all types—in applications ranging from electrical home appliances to large industrial furnaces—are made of this excellent alloy.

Naturally, we take particular pride in our trademark: Nichrome—granted solely and wholly to us by the United States Patent Office forty-five years ago. Representing a series of superb heating and resistance alloys, developed and produced *only* by Driver-Harris, this trademark symbolizes *long life* and *trouble-free* operation to manufacturers everywhere.

Sole producer of Nichrome®, Advance®, Karma® and over 80 other alloys for the electrical, electronic and heat-treating industries.

*T.M. Registered in United States Patent Office by Driver-Harris Company August, 1908

SPECIAL PURPOSE ALLOYS SINCE 1899 — D/H — TRADE MARK REG. U. S. PAT. OFF.

Driver-Harris Company

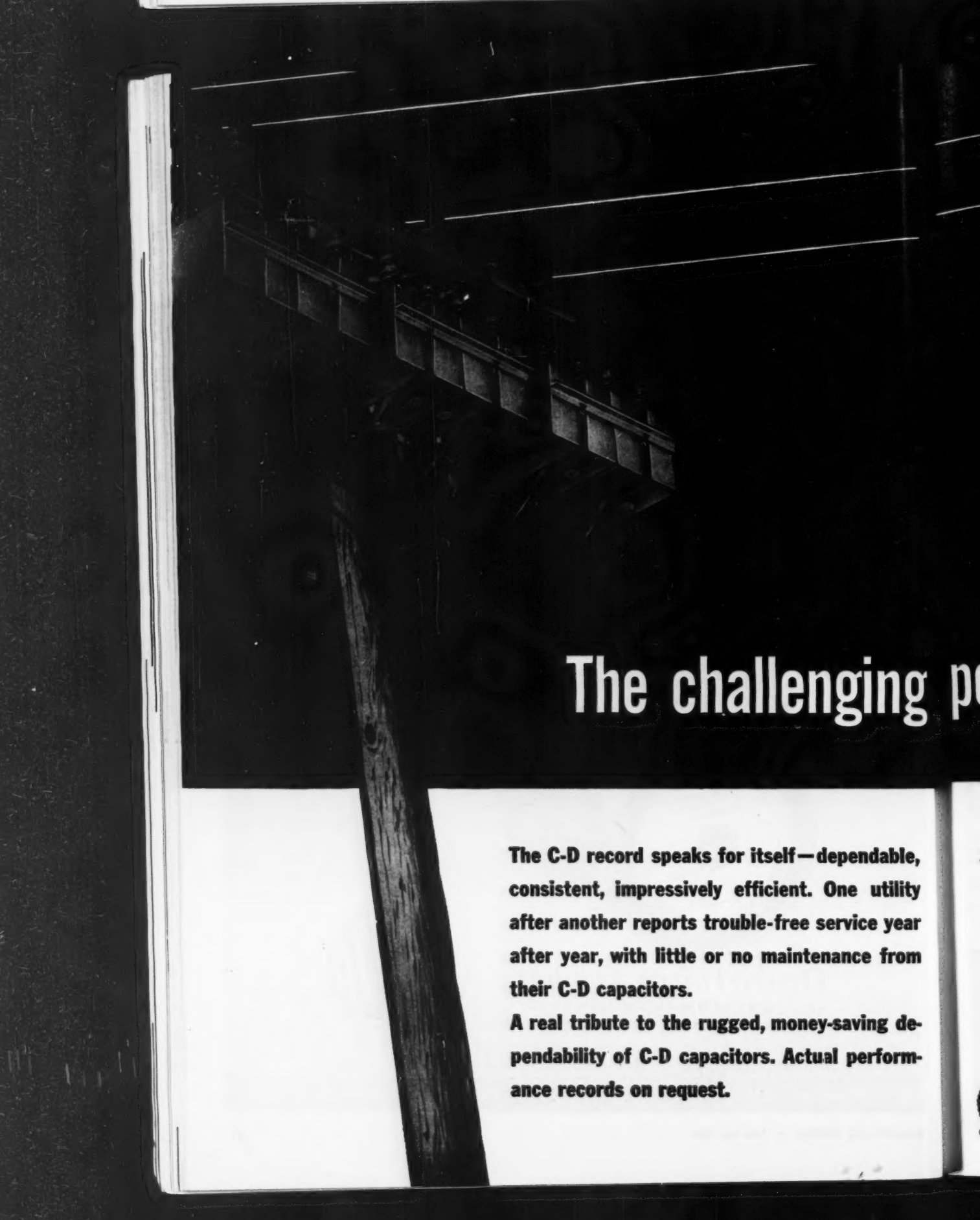
HARRISON, NEW JERSEY

BRANCHES: Chicago, Detroit, Cleveland, Los Angeles, San Francisco

Manufactured and sold in Canada by The B. GREENING WIRE COMPANY, LTD., Hamilton, Ontario, Canada

Factories: U.S.A., CANADA, ENGLAND, IRELAND, FRANCE, ITALY, SPAIN Representatives in 38 COUNTRIES

MAKERS OF THE MOST COMPLETE LINE OF ELECTRIC HEATING, RESISTANCE AND ELECTRONIC ALLOYS IN THE WORLD



The challenging po

The C-D record speaks for itself—dependable, consistent, impressively efficient. One utility after another reports trouble-free service year after year, with little or no maintenance from their C-D capacitors.

A real tribute to the rugged, money-saving dependability of C-D capacitors. Actual performance records on request.

performance of C-D capacitors

These exclusive C-D features mean more value for your capacitor dollar:

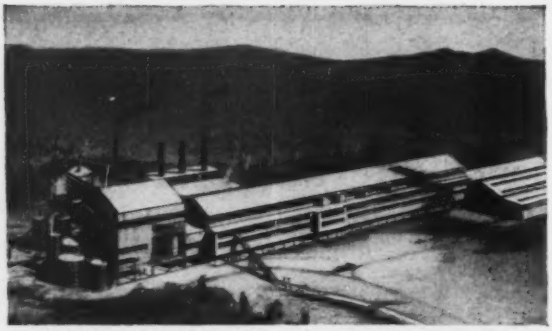
- Case SAND-BLASTED for longer-lasting finish
- Solderless service connector
- Heavy-duty wet process porcelain bushings for longer creepage path, less breakage, higher impulse rating
- Wide margin between paper and foil provides higher impulse level
- Capacitor impregnated and case filled with non-inflammable, non-explosive Dykanol
- Use of C-D's Dykanol results in lower unit weight per Kvar; high stability; long life
- Many small sections in series-parallel results in low voltage gradient; no corona; lowest dielectric unit stress
- Only C-D capacitors (from 230 to 13,800 volts), are tested at full rated voltage for a period sufficient to establish ultimate heat rise

If you are considering an installation of industrial, station or pole-type capacitors for power-factor improvement, you can save maintenance dollars by talking it over with a C-D engineer. Cornell-Dubilier Electric Corp., Dept. D-63, South Plainfield, N. J.

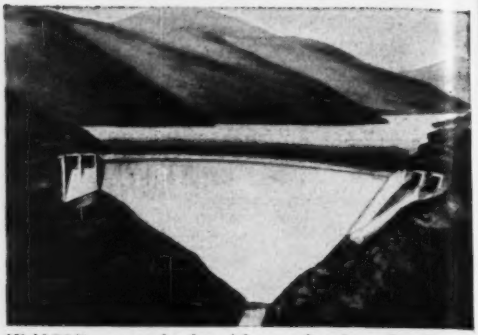
CONSISTENTLY DEPENDABLE

CORNELL-DUBILIER CAPACITORS

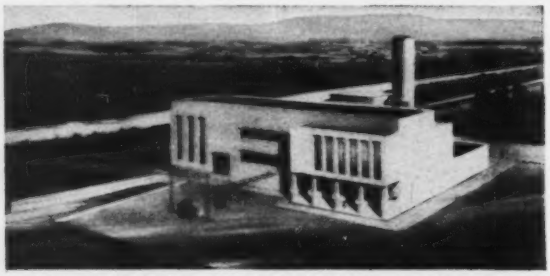
PLANTS IN: SOUTH PLAINFIELD, N. J.; NEW BEDFORD, WORCESTER, CAMBRIDGE, MASS.; PROVIDENCE, R. I.; INDIANAPOLIS, IND.; FUQUAY SPRINGS, N. C. AND SUBSIDIARY: THE RADIART CORP., CLEVELAND, OHIO



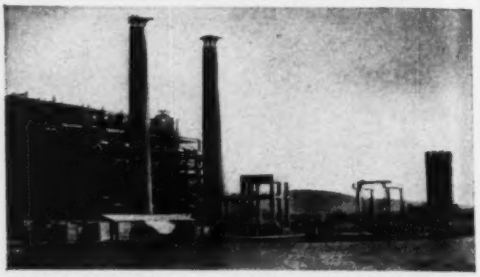
IT TAKES MANY SKILLS to build a newsprint mill, even more to build the *first* one in India! That's what EBASCO is doing at Nepanagar, India. Purchase of equipment and supervision of installation and operation are part of EBASCO's responsibility.



IN JAPAN, as a member firm of Overseas Consultants, Inc., EBASCO is supervising design and construction of this dam. To be part of the Kamishiiba Hydro-Electric Development of the Kyushu Electric Power Co., it will be the first arch dam constructed in Japan.



ON THE PO RIVER, near Torino, Italy, the Moncalieri Steam Electric Station will be constructed. EBASCO engineers are handling the design of this 37,500 KW plant and, in addition, purchasing and expediting materials and equipment for the Azienda Elettrica Municipale di Torino.



MODERN GREECE meets ancient Greece where the Aliveri Steam Electric Station is being built, as part of a new power system. At the right of the photo, stands a centuries-old signal tower. When completed the new system will include 3 hydro plants.

HOW ONE U.S. FIRM IS HELPING TO BUILD A BETTER WORLD

For nearly fifty years EBASCO has been one of the world's leading firms of engineers, constructors, and business consultants. The design and construction services of EBASCO are utilized by large and small companies in practically every field of business and industry in the United States. Today, in addition to its clients in this country, EBASCO is serving many clients in foreign countries—helping them rebuild war-torn nations, speed industrial progress, and introduce modern technological improvements.

Pictured on these pages are six typical EBASCO projects overseas, illustrating the many different types of installations EBASCO handles from start to finish. Because EBASCO integrates many skilled men and many specialized services into one smooth-working organization, it is equipped to do an entire job, or any phase of it, any place in the world.

If you need a new plant . . . or want to improve your present facilities . . . EBASCO can help you. We have a booklet called "The Inside Story of Outside Help" that describes our services in detail. May we send you a copy? Address: Ebasco Services Incorporated, Dept. M, Two Rector St., New York 6, N. Y.

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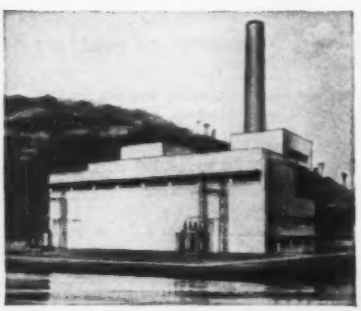
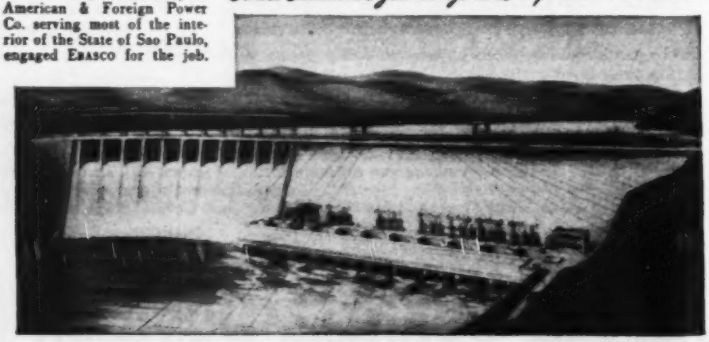
Ebasco Teamwork gets things done anywhere in the world



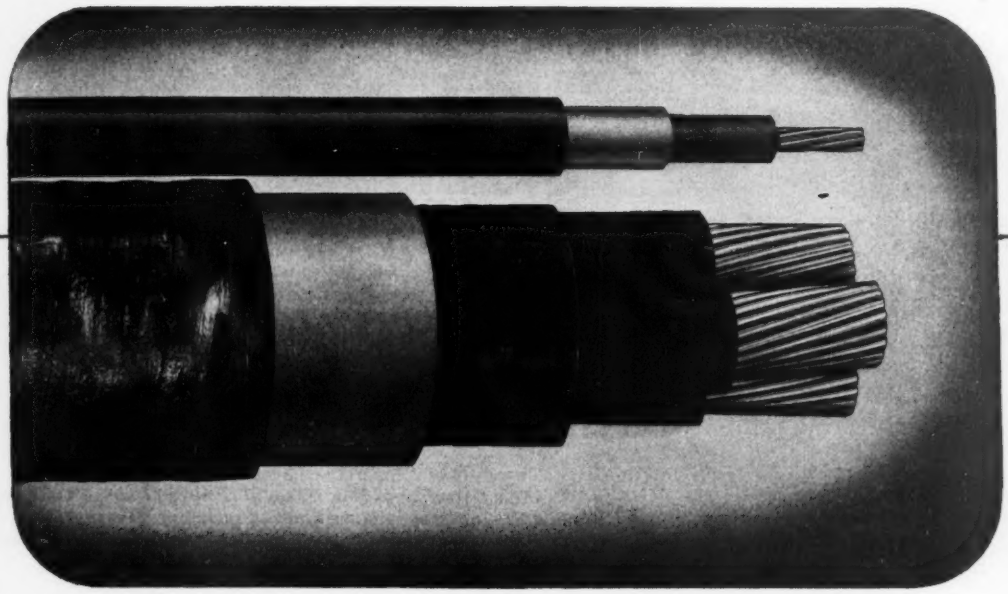
INDIA'S Bombay Harbor is the location of the Trombay Thermal Electric Station, a 125,000 KW plant. EBASCO is handling the engineering and construction, the training of Indian personnel and starting up of this modern station which embodies semi-outdoor design for the Tata Power Co., Ltd.

IN BRAZIL, the Piexoto Hydro-Electric Development will have an ultimate capacity of 400,000 KW. *Cia Paulista de Forca e Luz,* a subsidiary of American & Foreign Power Co. serving most of the interior of the State of Sao Paulo, engaged EBASCO for the job.



ROEBLING PROTECTIVE COVERINGS ON LEAD SHEATHED CABLE

for utilities, chemical plants and the petroleum industry



LEAD SHEATHED CABLES used in certain applications by public and private utilities, chemical plants and the petroleum industry are often impaired by electrolysis or chemical corrosion. But such corrosive action can be effectively reduced, and cable life extended, by using Roebling Paper Insulated and Varnished Cambric Cables with either of two outer protective coverings.

One of these coverings is an extruded thermoplastic sheath employing a special high-molecular weight polyethylene. The other is ROESHEATH, built up of neoprene and neoprene-filled fabric tapes and vulcanized directly over the lead sheath. Both coverings not only provide essential protection, but, in some cases, may permit the thickness of the lead sheath to be reduced.

For longer, more dependable cable life and worthwhile economy write for full information... and get our recommendations for solving any special problem.

John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

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JAR ROEBLING

EVER GET COMPETITIVE BIDS ON LEAKAGE DISTANCE?

A quick measure of comparative effectiveness of insulators under contamination conditions is in *inches of leakage distance.* There are more important factors—some kinds of inches-of-leakage-distance are better than other kinds of inches-of-leakage-distance. But even on the simplest basis, the plain fact is that Lapp Fog-Type insulators—suspensión types, Station Posts, Line Posts, even small one-piece pin-types—provide more leakage distance than conventional types . . . and that leakage distance costs *less per inch.*

There's more . . . about *uniformity* of leakage surface and the hazards of narrow shielded hot-spots—about surfaces exposed to wetting and the cleansing action of wind and rain. If steadily increasing industrial contamination is threatening leakage current flashover on any of your system . . . if you're paying 1953 labor rates for changing out or washing insulators . . . there's important money to be saved by your company, if you'll let us tell you the Lapp Fog-Type story—and about Lapp Fog-Type insulators for all line or station requirements.

Lapp Insulator Co., Inc.,
Le Roy, New York.

HOLAN
HYDRAULIC TOWERS
Speed Aerial Work . . .
Protect Operating Budgets
This on-the-job view of a Holan Box-Girder-Type Hydraulic Tower is typical of installation and maintenance scenes in which Holan mobile equipment is saving on operating costs for hundreds of municipalities and utilities. Unit shown is a Model 1320-R Hydraulic Tower with eleven-foot rotary platform, controlled from the upper safety rail. Exclusive box-girder lift provides extra strength, saves maintenance cost by relieving cylinders of wear. Cuts time on the job by getting into position swiftly and giving men relaxed confidence at work because it never sways or sags. Other models with lateral or fixed platforms, heights of 17′ or 30′.
Ask for Catalog Sheets on Holan Mobile Equipment

The dependable name in utility bodies

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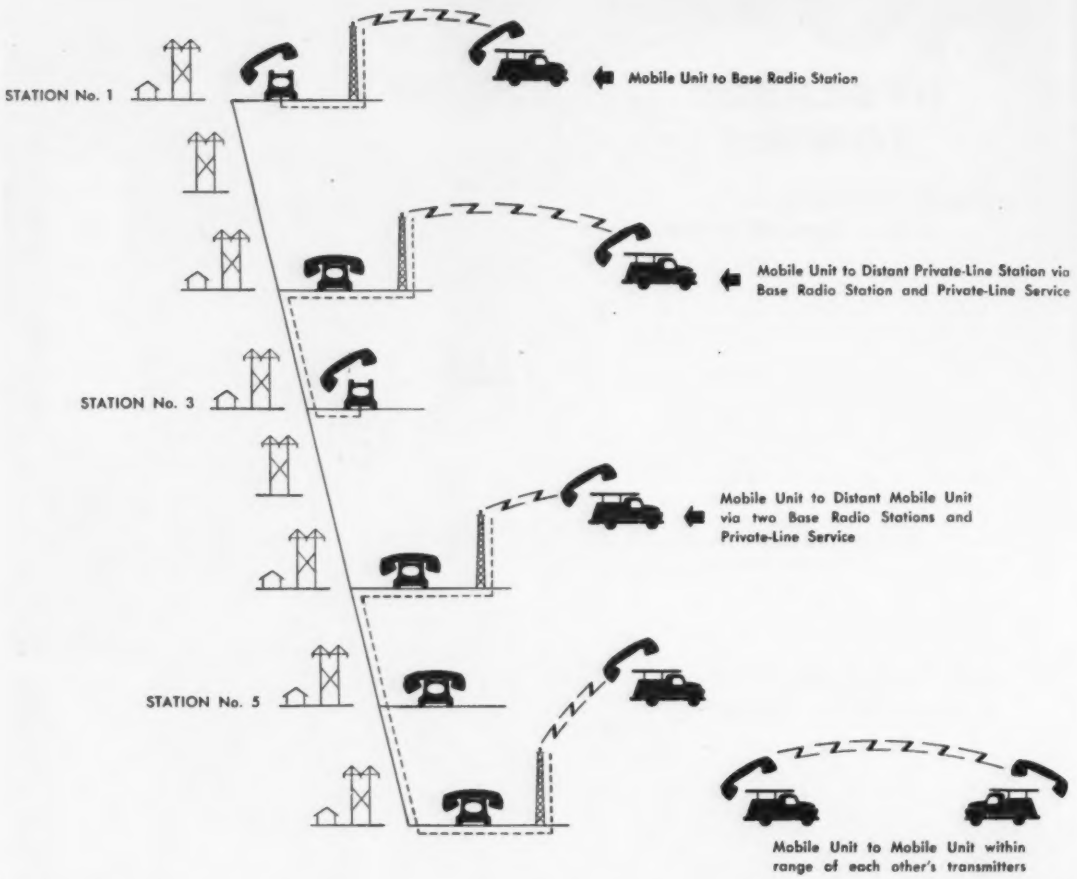
BELL SYSTEM COMMUNICATIONS

for flexibility all along the line


STATION No. 1
Mobile Unit to Base Radio Station
Mobile Unit to Distant Private-Line Station via Base Radio Station and Private-Line Service
STATION No. 3
Mobile Unit to Distant Mobile Unit via two Base Radio Stations and Private-Line Service
STATION No. 5
Mobile Unit to Mobile Unit within range of each other's transmitters

With integrated mobile radio and private-line telephone service, this Bell System setup is adaptable to many requirements.

Of course, this layout may not fit your particular needs. But Bell System engineers can design one that will. They'll study your operations, then tailor a system to your special requirements.

For Bell System communications you pay a fixed monthly charge—which is complete. It includes continuous maintenance, resources to meet emergencies . . . all the "extras" that would otherwise be your responsibility and expense.

Your Bell Telephone Company will be glad to study your communications problems and needs without charge.

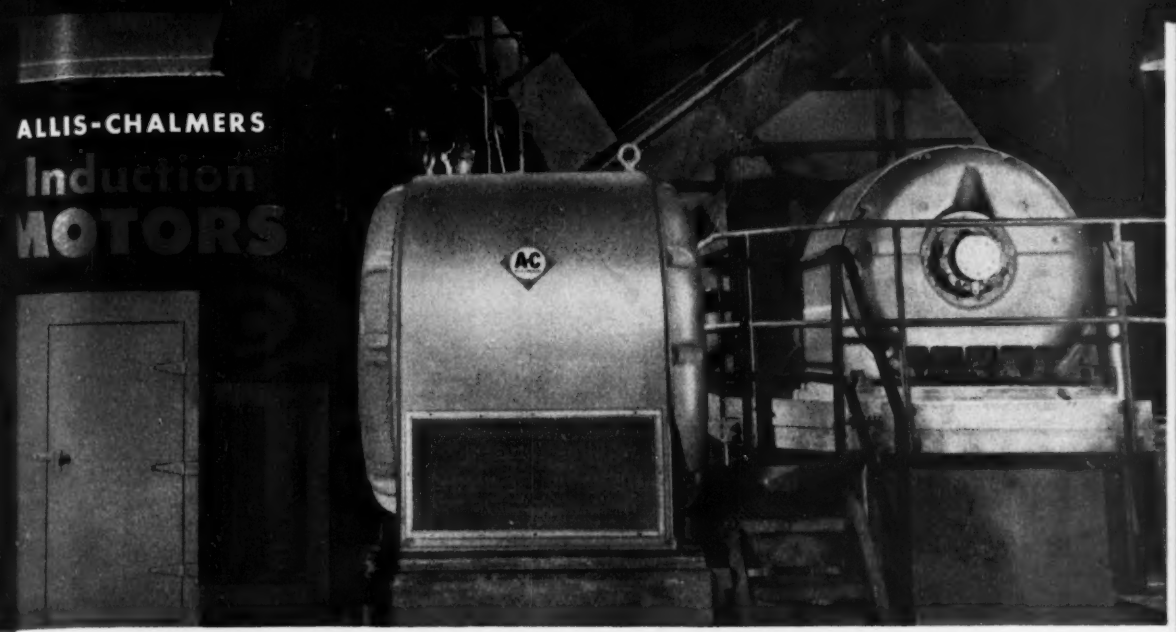
PRIVATE-LINE TELEPHONE

TELETYPEWRITER

MOBILE TELEPHONE

METERING CHANNELS

BELL TELEPHONE SYSTEM



Left to right (above) are drip-proof, silicone insulated, 1000-hp, forced and induced-draft fan motors for unit No. 2. Forced draft fan motors for unit No. 3 will be of the weather-protected type for installation outdoors.

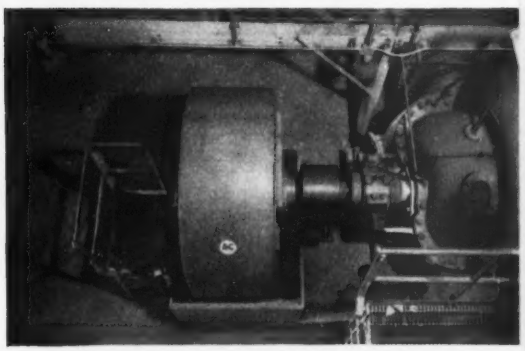
LET'S TAKE A LOOK AT TANNERS CREEK

One thing you're sure to notice at the Tanners Creek plant is that all the major auxiliaries for generating unit No. 2 are driven by Allis-Chalmers motors. Pictured here are a few of the larger ratings in this modern power plant of Indiana & Michigan Electric Company, a part of the American Gas and Electric system.

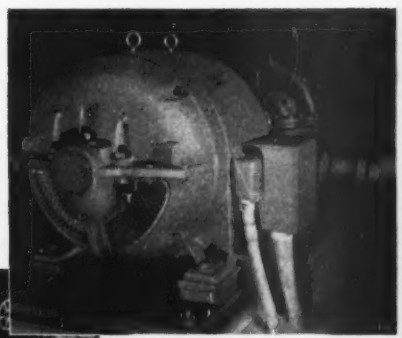
It's worthy of note that A-C is also building the motors for generating unit No. 3, scheduled for operation in 1954.

Allis-Chalmers builds a complete line of integral horsepower motors for power plant service, and your A-C representative can help you select the motors you need.

A-4084



One of two 300-hp, 2300-volt, 218-rpm, drip-proof squirrel-cage motors driving circulating water pumps.

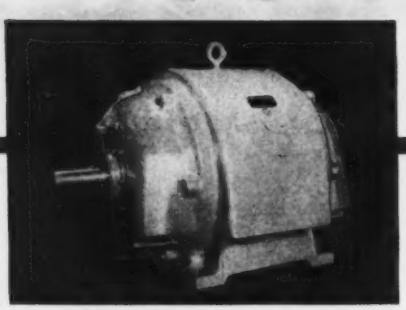


Rated 200 hp, 2300 volts, 1760 rpm, this drip-proof squirrel-cage motor driving an Allis-Chalmers screen wash pump is typical of the smaller ratings.

ALLIS-CHALMERS

Milwaukee 1, Wisconsin

These dependable boiler-feed pump motors are rated 2000 hp, 2300 volts, 3580 rpm each.



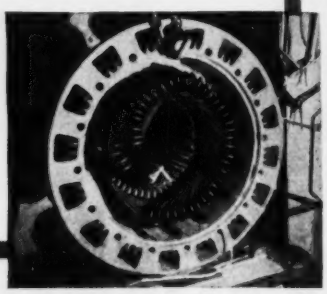
Drip-proof motor of the type used in severe service applications, where motors are exposed to the weather or are subjected to frequent overloads.

A good example of outdoor service is this pole shaver, driven by 3 Continental 440 V. drip-proof type polyphase motors: 2-15 hp. 1800 rpm.; 2-3/1½ hp. 1200/600 rpm.; and 1-3 hp. 1800 rpm.

CONTINENTAL Insulates Motor Windings

with

NATVAR VARNISHED FIBERGLAS



Stator of Continental 6600 V. explosion-proof type, showing windings in place. They are insulated with Natvar Varnished Fiberglas to give extra protection against moisture, dirt, and heat.

Continental Electric Co., Newark, N. J., manufactures polyphase motors from 1 — 700 hp. and in several types including drip-proof, splash-proof, and explosion-proof. They also make generators, dynamotors, converters and motor-generator sets.

Thousands of Continentals are giving uninterrupted service in refineries and other field uses with little or no protection from the weather. To insure this performance, insulating materials are carefully chosen for their ability to stand up under severe operating conditions. Natvár Varnished Fiberglas is used because of its superior resistance to both moisture and heat.

If you need flexible insulating materials with good physical and electrical properties, and exceptional uniformity, it will pay you to get in touch with your Natvar distributor, or with us direct.

Natvar

Natvar Products

- Varnished cambric—straight cut and bias
- Varnished cable tape
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- Varnished Fiberglas cloth
- Varnished papers
- Slot insulation
- Aboglas®, asbestos-Fiberglas composite
- Varnished tubing and sleeving
- Varnished identification markers
- Lacquered tubing and sleeving
- Extruded plastic tubing and tape
- Styroflex® flexible polystyrene tape
- Extruded plastic identification markers

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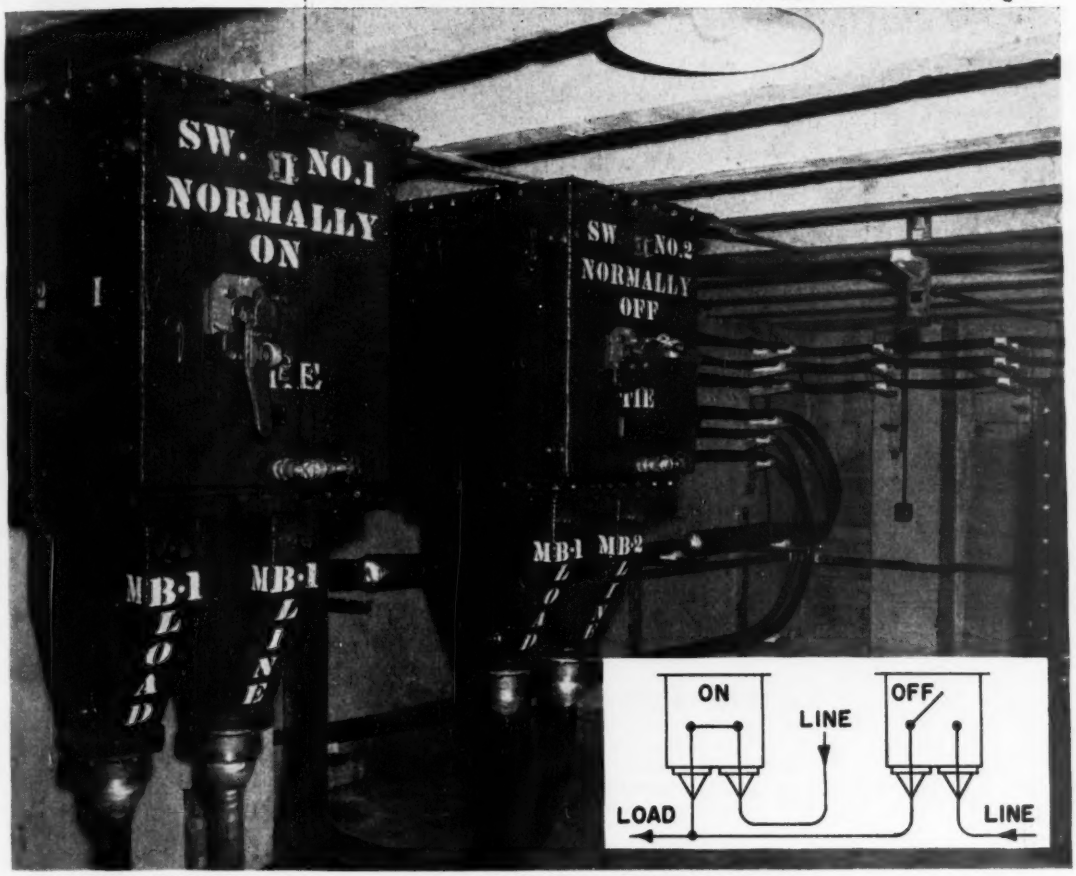
221 RANDOLPH AVENUE • WOODBRIDGE, NEW JERSEY

G&W TYPE "RA" LOAD BREAK OIL SWITCHES

provide safe sectionalization for cable system FLEXIBILITY



400 AMPERES STANDARD
(1000 & 1500 amperes special)
STANDARD VOLTAGES
600, 7500, 15000
23,000 (illustrated), 34,500

TYPE "RA" SWITCHES PROVIDE FLEXIBILITY

With "RA" switches located at strategic points in cable circuits to provide flexibility, a system can be so arranged that important loads will have an alternate source of power immediately available.

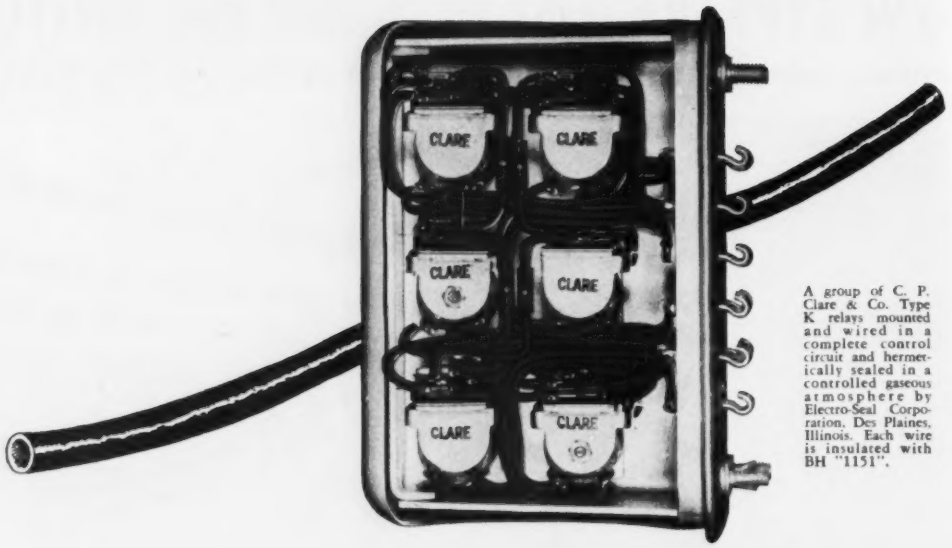
TYPE "RA" SWITCHES ARE SUBMERSION PROOF

Since their introduction in 1928, Type "RA" switches have had a trouble-free operating record which fully justifies their use as load break disconnects for single or multiple circuits. They are safe and reliable, combining simplicity with economy in construction, installation, and maintenance. They will operate properly after long periods of inactivity to provide fast and convenient isolation of cable sections in case of trouble and to permit rapid re-routing of circuits to materially reduce losses normally incurred through electric service interruptions. Exposure to weather extremes or complete submersion for prolonged periods will not affect prompt and safe operation when necessary. They are water, oil, and air-tight.

D 533

G&W ELECTRIC SPECIALTY CO.
7780 Dante Avenue • Chicago 19, Illinois
Cable Terminating, Connecting and Sectionalizing Devices
Representatives in principal cities of U.S.A.
In Canada—Powerlite Devices, Ltd., Toronto, Montreal and Vancouver

Send for Bulletin DB51 which gives dimensions and prices on various styles of 2, 3, and 4 way "RA" switches



A group of C. P. Clare & Co. Type K relays mounted and wired in a complete control circuit and hermetically sealed in a controlled gaseous atmosphere by Electro-Seal Corporation, Des Plaines, Illinois. Each wire is insulated with BH "1151".

1¼¢ *lengths* of BH "1151" cut reject losses

Here is what BH "1151" Silicone Rubber coated Fiberglas Sleeving has accomplished for the makers of an aircraft-type relay which is hermetically sealed in an enclosure qualified for the armed service miniaturization program:

1) Positive protection at 2500 volts RMS, despite rough handling in assembly — bending around sharp metal corners, pressing tight against metal parts.
2) Practically stopped lead breakage under prolonged frequency vibration.
3) Greatly retarded component failure due to vibration and shock.
4) Unaffected by soldering temperatures of 475°F.
5) Does not crack, melt, deform or outgas under application temperatures from minus 70°F. to plus 450°F.

Send Bentley, Harris your requirements — voltages and temperatures — get free production samples of recommended BH Tubing and Sleeving for your particular insulation problem.

Address Dept. W-6

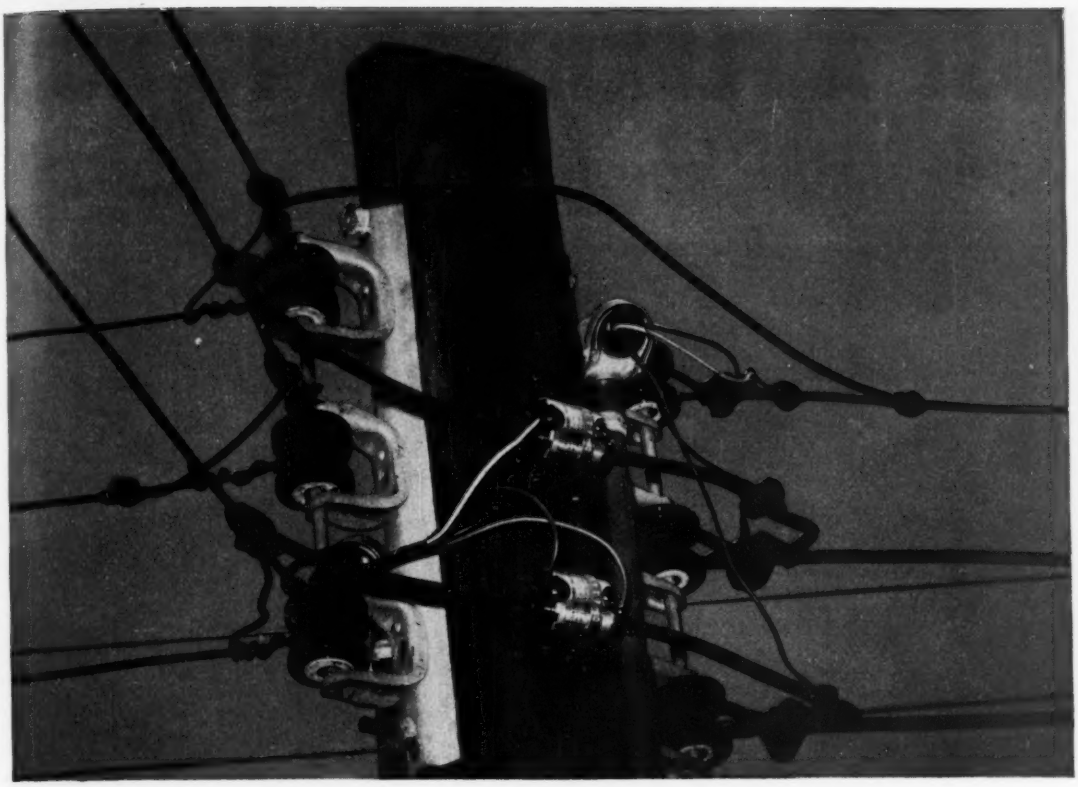
Bentley, Harris Manufacturing Co.
Conshohocken, Pa.

BH FIRST IN

use of Fiberglas
heat-treated Fiberglas
true high temperature flexibility
vinyl-coated Fiberglas
silicone rubber coating
colors in silicone rubber
true Class B (130°C.) protection

BH *Fiberglas** SLEEVINGS

*BH Non-Fraying Fiberglas Sleevings are made by an exclusive Bentley, Harris process (U. S. Pat. No. 2393530). "Fiberglas" is Reg. TM of Owens-Corning Fiberglas Corp.



CUT INSTALLATION COSTS

with the *new* SANGAMO Type R Current Transformers

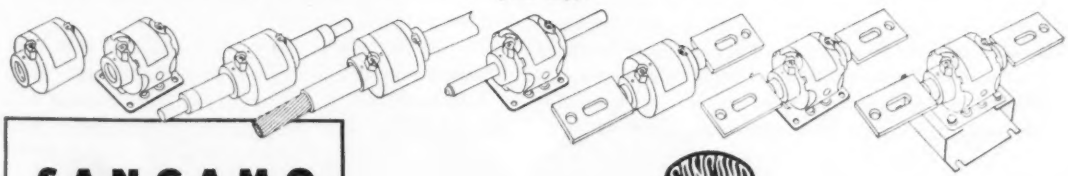
Eight variations of ONE basic transformer permit almost any primary arrangement.

New time and money saving installation methods are now made possible by the small size and light weight of Sangamo Type R Current Transformers.

In the installation shown above, made by a southern utility company, the base of the transformer is mounted to the pole. However, this rugged transformer is light enough so that it can also be mounted without the base by merely supporting it by the cable. Another saving is enabled by wiring secondary leads in the shop, with subsequent reduction in field installation time.

Type R Transformers are encased in a high impact phenolic shell filled with a thermo-setting plastic that eliminates voids and prevents moisture from reaching the core windings. The large opening in the Type RC-6 Transformer will admit a 250 MCM weatherproof cable in the 200 ampere rating, and 500 MCM weatherproof in the 400 ampere.

Full information is given in Bulletin 501. Be sure to get your copy.



SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

Only Measured Facts are Known Facts

SM53-5

USE A FLEXIBLE RING BUS

Without the Usual High Cost!

No costly extra cubicles needed! Ring buses are built into standard units of Allis-Chalmers Metal-Clad Switchgear. This economy, together with their other advantages, makes ring bus schemes more attractive than ever.

Important Advantages

First, there's the flexibility of a ring bus as shown in the single line diagram above. For example, one breaker functions as both a feeder breaker and a bus tie breaker, and it is possible to feed each circuit from either of two breakers. In addition, a ring bus provides continuous service while a circuit breaker is taken out for routine maintenance.

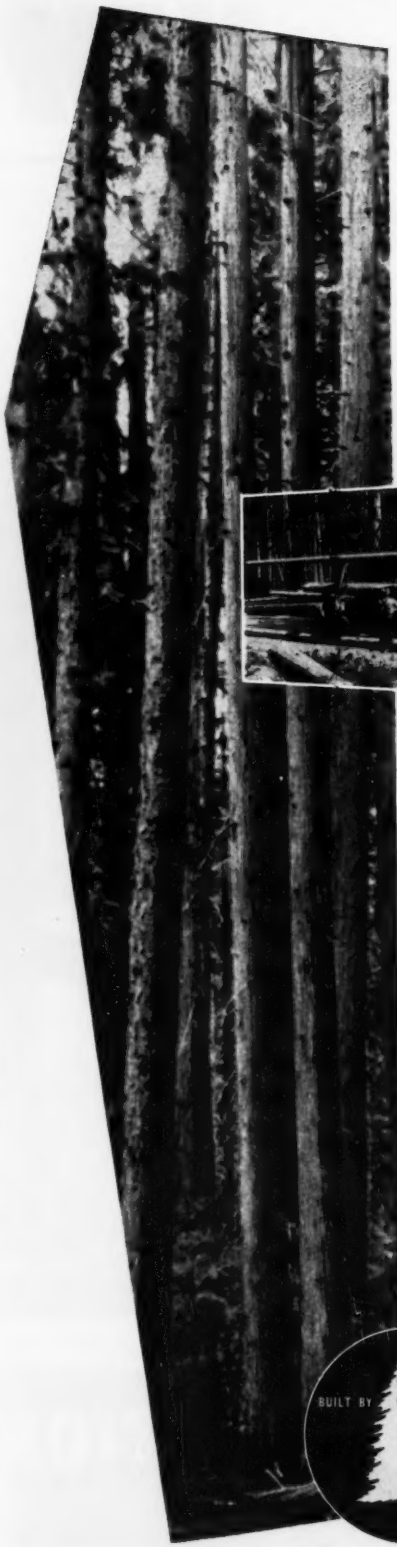
While these advantages can be enjoyed with other circuit arrangements, additional equipment is usually required and it becomes too expensive. As a result, ring bus schemes are often overlooked. But with Allis-Chalmers switchgear a ring bus scheme is simple. The only change from standard construction is the diagonal bus from the front of one unit to the rear of the adjacent unit.

It's time you enjoy the flexibility of a ring bus with Allis-Chalmers switchgear — without the usual high cost.

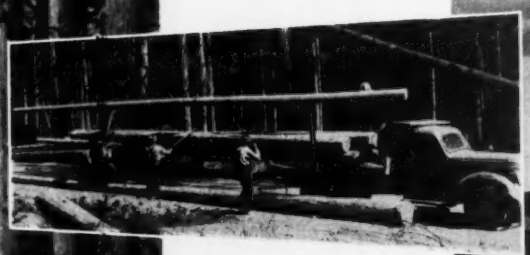
Talk it over with an A-C engineer. Call your nearby A-C district office, or write Allis-Chalmers, Milwaukee 1, Wis.

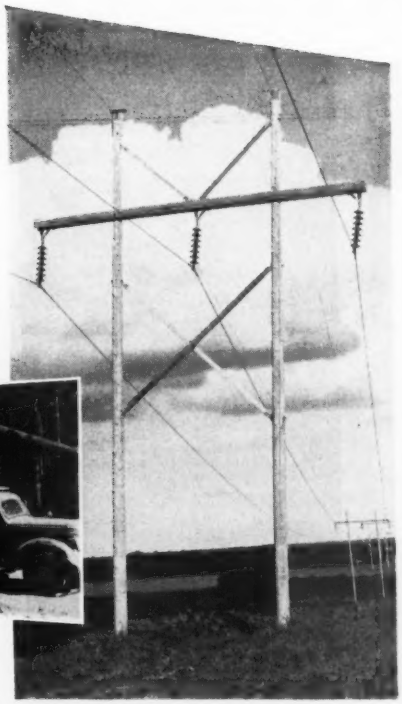
A-4001

ALLIS-CHALMERS



...perfected for posterity





SELECTED WESTERN RED CEDAR POLES

prepared for a long future with the

LIFE-SPAN

CLEAN, ODORLESS, FULL LENGTH IMMUNIZATION TREATMENT

Poles represent a major item in construction costs! Why take chances? Specify LIFE-SPAN Western Red Cedar poles and be *sure* of trouble-free service to pole-line obsolescence. Reduce maintenance and secure lower per annum costs on every pole in your lines.

The clean, safe, easy-to-handle LIFE-SPAN Poles will get you lots of compliments and praise from the linemen—build customer good-will and good public relations.

When you're planning construction, remember the name LIFE-SPAN. You just can't beat Nature's best, treated the LIFE-SPAN Way.

CONSOLIDATED TREATING CO.

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BUILT BY NATURE — Life Span

SOLD ONLY BY THE FOLLOWING:

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Suppliers for Joslyn Mfg. & Supply Co.

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NEW UTILITY STATIONS C-E EQUIPPED

Includes stations placed in operation since the war (in white) and those under construction or being engineered.

TIDD • JENNISON
CECIL LYNCH • HAVANA
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O. H. HUTCHINGS • REX BROWN
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PALATKA • JOHNSONVILLE
DANSKAMMER • BECKJORD
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OAK CREEK
AURORA
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MULLERGREN
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MILLIKEN
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GALLATIN
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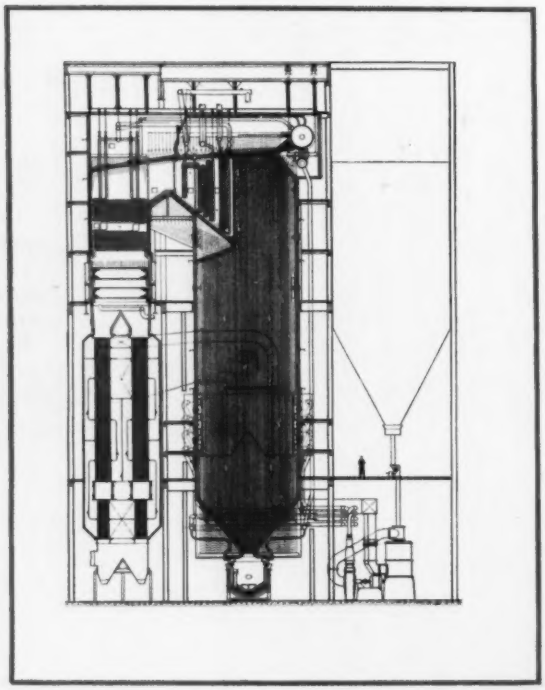
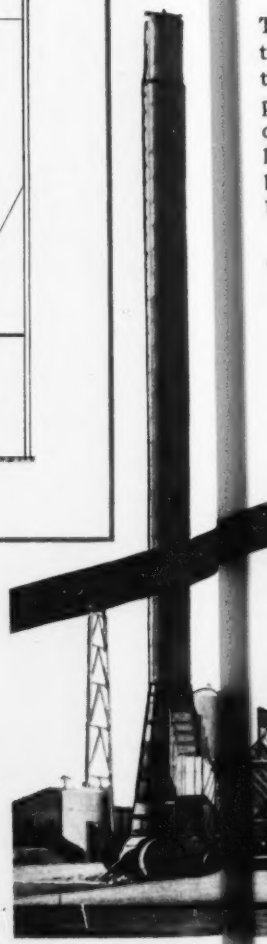
NEW





The cross-sectional view above shows one of the two C-E Units which comprise the first section of the Meramec Power Plant of Union Electric Company. These units are of the radiant-reheat-type with the reheater section located between the primary and secondary superheater surfaces. Economizer surface is located below the rear superheater section and tubular type air heaters follow the economizer. Pulverized coal firing is employed using bowl mills and tilting, tangential burners. The boiler is equipped to burn natural gas as an alternate fuel. Each unit serves a 125,000 kw turbine-generator operating at a throttle pressure of 1250 psi and a temperature of 950 F, reheated to 950 F.

COMBUSTION

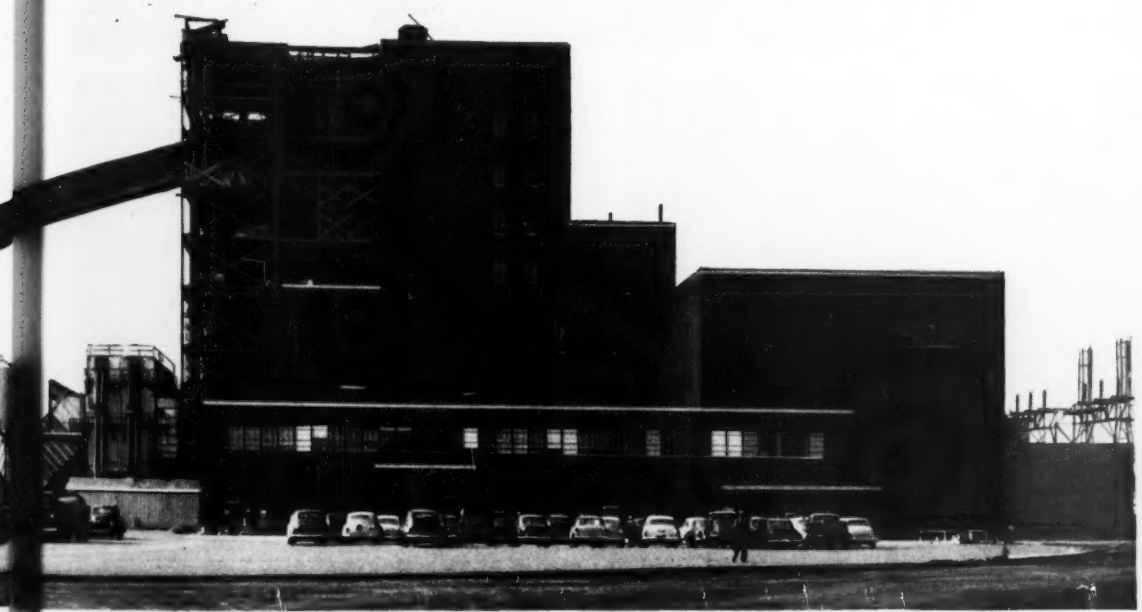
200 MADISON AVENUE, NEW YORK 16, N. Y.

Meramec Power Plant goes into service

Timed to meet growing demands on the system, the new Meramec Power Plant of the Union Electric Company of St. Louis, Missouri, was recently placed in service. The first section of this plant comprises two turbine-generators rated at 125,000 kw each. Engineering and design were handled by Union Electric Company and construction by United Engineers and Constructors, Inc.

The new plant is located about 20 miles south of downtown St. Louis where the Meramec River joins the Mississippi. It will, of course, be tied in with the greater Union Electric system which is subject to rather extreme variations occasioned by the availability of hydro power. Generated power, however, recently reached a peak demand of 1,108,000 kw. When supplying power for outside requirements a 1,178,000 kw peak has been served.

Each of the new turbine-generators is served by a C-E Steam Generating Unit, a cross-sectional elevation and brief description of which appears on the opposite page.



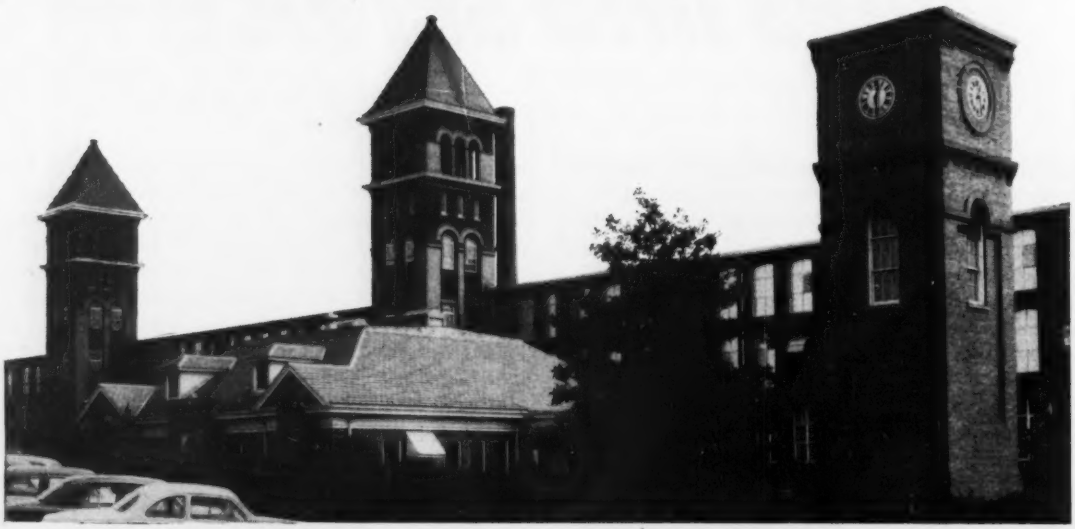
B-661

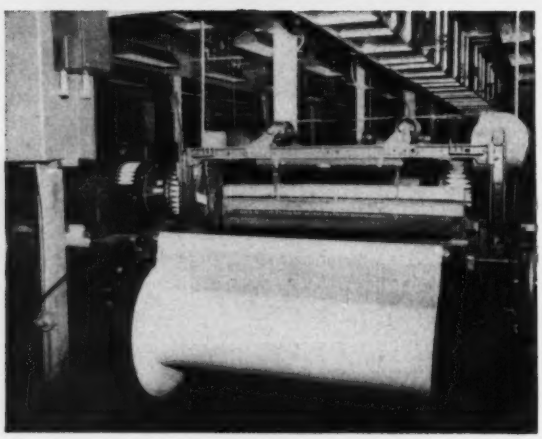
ENGINEERING, Inc.

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT

C-E

For long life at 100°F. ambient—
world's largest weaving mill





AMERICAN STEEL & WIRE DIVISION
USS
AMERICAN ELECTRICAL WIRE AND CABLE
UNITED STATES STEEL

A STANDARD CABLE FOR

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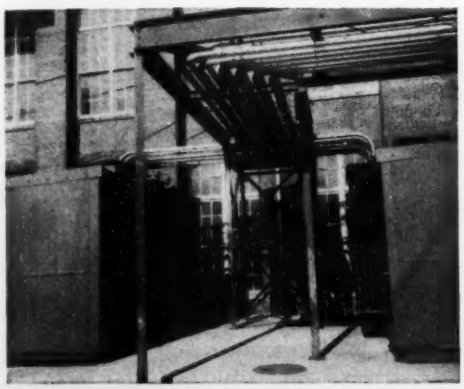

● At Lancaster, S. C., Springs Cotton Mills operates the largest weaving mill in the world under one roof. Some time ago, they completely revamped the electrical layout, and changed from a single bus bar source to a system of 11 separate sub-stations. Now, an electrical failure will affect only *one* part of the mill.

To further guard against failure, 500 MCM American Varnished Cambric Cable is used for feeders from the sub-stations to various parts of the mill. There's no better cable for a job like this.

American Varnished Cambric Cable is flexible and easy to handle. There are no difficult terminal problems because potheads are not required as with paper cable. Current rating is high, even under adverse ambient temperature and humidity conditions. Service life is great, because of the special American heat-resisting varnished cambric tapes. Here is the perfect insulation for industrial plant use.

Whenever you have a tough insulation problem, be sure to get in touch with the cable engineers at American Steel & Wire. They'll make sure that you get the most for your money —no matter what kind of a cable problem you have.

AMERICAN STEEL & WIRE DIVISION
UNITED STATES STEEL CORPORATION
GENERAL OFFICES: CLEVELAND, OHIO

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▼ mold cured portable cord
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☐ Please give me more information about American Varnished Cambric Cable.
☐ I'd like to talk to your representative.

Name .....
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Address .....
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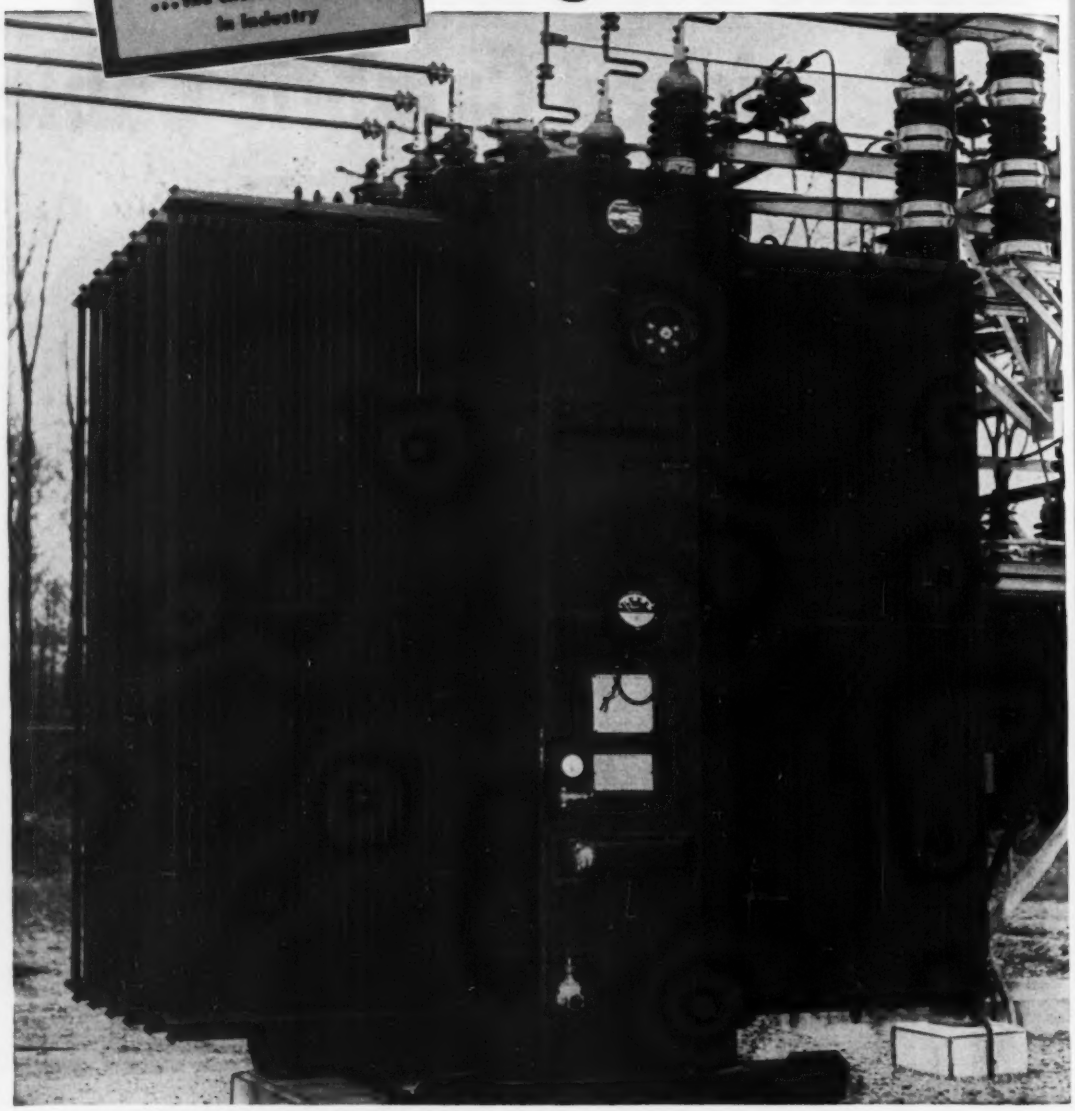
UNITED STATES STEEL

Wagner
TRANSFORMERS
...the choice of leaders
in industry

Wagner Transformers



6000 KVA WAGNER POWER TRANSFORMER, outside the Studebaker Plant, where power is received at 26.4 kv and is stepped down to 13.2 kv for distribution to the seven unit substations in the plant.

Wagner transformers were chosen for this installation, as they are for many industrial and power company installations, because of their ability to give adequate and reliable service over unusually long periods of time.

Why not discuss your next transformer installation with the Wagner engineer nearest you? There are Wagner branches in 32 principal cities. Bulletin TU-181 gives full information on Wagner Power Transformers, and Bulletins TU-13 and TU-56 tell about Wagner Unit Substation Transformers. Write for your copies.

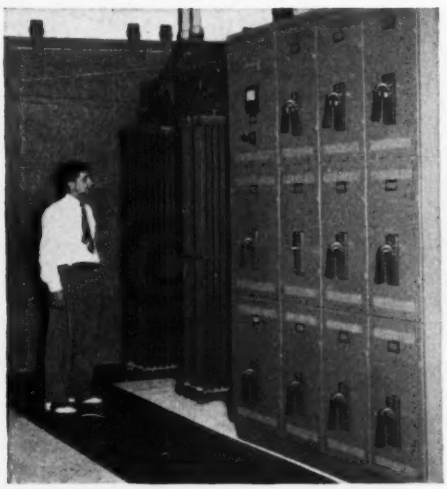
used by Studebaker in new power distribution system planned for present and future needs

New Jersey plant can convert from military to auto assembly production without extensive system changes!

The modern power distribution system at the Studebaker Corporation plant at New Brunswick, New Jersey, has been planned with an eye to the future. While the plant is now manufacturing military jet engine parts, it will eventually become eastern auto assembly headquarters for Studebaker.

For this reason, the power load is divided between seven load center substations, all equipped with Wagner Unit Substation Transformers, spaced 160 feet apart down the center of the building. In addition to insuring an adequate power supply for present purposes, this plan provides a dependable supply of power from short secondary feeders at any time in the future. No extensive system changes will be required at the time of plant conversion.

500 KVA WAGNER TRANSFORMER with switchgear, one of two such units that supply 208Y/120 three phase power for lighting and other small power loads.



1000 KVA WAGNER UNIT SUBSTATION TRANSFORMER, at one of the five load centers that deliver 480 volt, three phase power to large machines and equipment.

WAGNER ELECTRIC CORPORATION
6456 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

T53-10

KERITE
CABLE-GRAM
QUALITY IS THE PRODUCT OF INTEGRITY. ALMOST 100 YEARS OF UNFALTERING ADHERENCE TO THE HIGHEST STANDARDS OF MANUFACTURE HAS MADE QUALITY AN INHERENT COMPONENT OF KERITE INSULATED CABLE. ITS DEPENDABLE PERFORMANCE HAS BEEN MEASURED BY TIME, THE ULTIMATE TEST OF ENDURING QUALITY. ITS PROPERTIES, STILL UNRIVALED TODAY, MERIT CONTINUED USER CONFIDENCE.
THE VALUE AND SERVICE LIFE OF A PRODUCT CAN BE NO GREATER THAN THE INTEGRITY AND CRAFTSMANSHIP OF ITS MAKER.
1854 KERITE FACTORY 1864

KERITE CABLE

THE KERITE COMPANY—30 Church St., New York 7, N. Y.
Offices also at 122 S. Michigan Ave., Chicago; 582 Market St., San Francisco;
3901 San Fernando Rd., Glendale 4, Calif.; 31 St. James Ave., Boston

Walter Sammis . . .

His Objectives as EEI President

A thoroughly understanding and completely objective attitude toward the problems of all power suppliers has been expressed by the incoming president of Edison Electric Institute, Walter H. Sammis, president of Ohio Edison Co, who succeeds Bayard L. England on July 1. Like his predecessor, Sammis stresses the contributions which the electric companies can make to the American economy, their service areas, and their customers. He wishes to obtain fair play in the solution of problems relating to the development and disposal of federal power.

More specifically, Walter Sammis has expressed his personal philosophy in terms of the following objectives:

1. Fostering a greater spirit of community service and area development on the part of the electric utility companies and their personnel so that the areas they serve may enjoy healthy and durable growth.

2. Concentrating upon the big task of making electricity do more for agriculture.

3. Furthering cooperative efforts between the electric utility industry and the Atomic Energy Commission in the development and utilization of atomic power for the general welfare of all the people.

4. Obtaining from the federal government equal treatment for the investor-owned companies and government-owned power agencies in opportunities for buying power from federal dams so that there shall be no unjust discrimination among electric customers.

5. Exerting every effort to have the federal government tax government enterprises competing with the private power industry on a basis equivalent to that of the electric companies.

6. Endeavoring to stop further expenditures by the federal government for the building of power plants and transmission lines which the electric companies are willing to build.

7. Endeavoring to get the federal government out of the power business as this becomes practicable. In the meantime, federal agencies should be required to charge the full cost of electric service to their customers so that these operations will cease to be a burden on the federal taxpayer.

Sammis believes that only an enlightened public opinion can make these objectives possible of accomplishment. Therefore, he intends to use every opportunity to make known to the American people the facts about the electric utilities.

But while leadership in tackling the major problems of the electrical industry can come from the president of EEI, full success of any program requires the support of all the membership. This should be readily forthcoming to provide the backing to which Walter Sammis is entitled for his willingness to serve the industry during the coming year.

What Do You Call It!

Incidental to compiling design data for transmission lines, Electrical World asked electric companies what type of relaying had been applied to their lines. The answers were supplied for over 275 lines by some 80 companies. Just in the 100-130-kv bracket alone there is information about 100 or more lines. Here's the way they run:

Impedance & Ground	Carrier
OC, RP, Residual	GCX
HZ	GMB
HZM Distance	HCZ
Distance & OC	Distance
Impedance	Distance & Carrier
Balance	HZ Impedance
HM, GCX, GK, ICC	Impedance Carrier
HKB, HZ	Directional Comparison
Distance GCY	Carr. Dist. & Dir. Grd.
Distance & Ground	Carr. Dir. Comp
Directional & Distance	Dir. Dist. & Gd Dir OC
Phase Imp., Grd Dir. Comp	Dist. & Dir. Gnd.
Reactance Phase & OC Grd.	Carr. Dir. Comp. & Dir. Dist.
HS Impedance	Dir. Dist., Prod. Gnd.
OC	Carr. Dist. & Dir. OC (BU Gnd.)
Pilot	Ph. & Gnd. Dir. Comp. (BU Carr OC)
Directional Distance	HZC, RC

Maybe there are that many ways of describing the versatility of relaying to meet anyone's needs and tastes. But it should not take all 36 characterizations to identify the principles applied. Undoubtedly the heterogeneous array could be rearranged and regrouped to signify something to others than relay experts. No one short of a relay expert can understand the many designations let alone reclassify them.

It would be interesting, if not more mystifying, if a few relay specialists would volunteer to unscramble the melange. That invitation is extended with the hope that it will be no longer necessary for an editor to draw his own confusions.

Heat Pumps and Power Sales Engineers

We are sure that if questioned every power sales engineer would say that a heat pump and a refrigerating machine are the same thing. But we are not so sure that every power sales engineer takes into consideration the dual functions of the heat pump.

To raise the temperature of a liquid or gas by taking heat from another liquid or gas is the function of a heat pump, according to general understanding. To lower the temperature of a liquid or gas by transferring heat from it to another liquid or gas is the function of a refrigerating machine, also according to general understanding. Apparently one machine is used for one desired result and another machine for another.

This disassociation of ideas in regard to mechanical heating and cooling can, and probably often does, operate as a mental block against thought that could undoubtedly extend the field of application of the heat pump. The block should be removed, and the heat pump generally recognized as a dual-purpose machine.

In a recent paper to the Southeastern Electric Exchange, F. R. O'Brien, Southern Research Institute, chopped away at this mental block. Pointing out its commercial and industrial possibilities, he gave several instances in which the simultaneous heating and cooling performed by the heat pump are utilized. Power sales engineers should be interested in them.

A dairy uses for pasteurization the heat removed by chilling the milk. But how many dairies use a refrigerating machine for chilling and a steam boiler for pasteurization?

In a sausage plant, heat picked up by cooling frankfurters is used to raise the temperature of process water. In how many meat packing plants are heating and cooling regarded as two separate functions?

In the concentration of fruit juices, milk, and other liquids, evaporation at low temperature is necessary. In some plants of this kind the heat of the water vapor is used for boiling the liquid. The heat pump does it. But in how many other such plants is the job done by fuel heat and vacuum pumps?

Many industrial processes require both heat and refrigeration. And in many, probably most, cases the two are looked upon as separate and distinct requirements. For the power sales engineer who recognizes that heating and cooling are the two sides of the same coin, wide opportunity opens up for service to his customers and to his employer.

Benefits Accruing

May, the month just past, was the time when manufacturers, distributors, dealers, and utilities all joined together to promote the sale of electric water systems. That is, they were supposed to according to a program set up by the National Association of Domestic and Farm Pump Manufacturers.

Did they all join in? Probably not. That would be too much to expect. In any program of joint promotion there are always some hold-outs.

Well, did enough join in to make the program a success? Probably yes, although it is too early yet to know how big or little a success.

But no matter whether the program, over all, was a big, medium, or small success or no success, the important thing to each participant is what he got out of it. And each one can figure that out for himself without waiting for all the returns to come in from the others.

That is what the electric utility can do—check up and see how many of its farm and other rural customers will be using around 200 kwhr per year additional as result of the program. Those customers immediately and automatically become prospects for water heaters, automatic clothes washers, and dishwashers, each adding substantially to kilowatt-hour sales per year, to dollar revenues, and to return on investment.

In terms of benefit to the utility, the sales of water pumps traceable to the promotional program are much less important than the potentials of additional load and revenue they open up. That is why the utility should check up and see what results were accomplished by "National Water Systems Month" in its service area. Such information can be as pleasant as valuable.

THE ELECTRICAL WEEK

The Issue's News Highlights—Walter H. Sammis, newly elected president of EEI, outlines a program to narrow down government activity in the power field.

Chairman Cole of Joint Atomic Energy Committee urges immediate start on power-producing atomic energy reactor. Elgin B. Robertson is elected AIEE president.

FPC fixes pool level of Vepco's Roanoke Rapids project and orders utility to pay government $250,000 yearly for upstream benefits . . . New hearings on St. Lawrence power project are scheduled to begin today before FPC.

Idaho PUC becomes first regulatory body to approve the issuance of 1,088,939 common shares, 1,088,940 of $1.28 cum conv $25 par preferred stock and a bank loan of up to $45 million from four banks required for proposed Puget Sound P&L and Washington Water Power merger. PUC says the evidence produced at the hearing showed the merged company would be "a financially stronger company, better able to finance and construct additional generating facilities, and to improve and expand its electric service" at substantial savings in operations. WWP's Pres K. M. Robinson reveals the Washington State PSC will resume hearings on July 6.

Off the New England Wire—Boston Edison and UWUA-CIO sign two year contract for 3,000 workers providing a flat 12½¢ an hour wage hike retroactive to Jan. 1 with a wage re-opening clause after April 1, 1954 . . . Hartford Electric Light is engaged in an extensive highway lighting modernization program involving the erection of 629 new standards along 10.5 miles of Hartford's downtown streets . . . Burlington, Vt., citizens vote 6-to-1 to authorize a $2.2 million bond issue toward completing construction of 27,000-kw steam plant. This brings total bond issues approved to $6.2 million. Green Mountain Power is to sell its distribution system in Burlington to the city and lease the new plant to GMP . . . A 115-kv tie line goes into service connecting New Bedford Gas & Edison Light and existing Cape & Vineyard high line from New Bedford with Boston Edison and Brockton Edison transmission systems.

Middle South Utilities Pres Edgar H. Dixon tells annual shareholders meeting that consolidated net earnings for 1953 are expected to be about $2.25 a share, based on average number of shares outstanding during the year. This compares with $2.08 reported for 1952. Shareholders approve increasing the authorized capital stock from 7.5 million to 12 million shares.

Central Illinois Public Service 20-day strike ends at four power plants as International Union of Operating Engineers' locals ratify the agreement of a general wage hike and additional adjustments in job classifications. Union dismisses the five-point unfair labor practice allegations filed with the NLRB.

Arlington, Ohio, Board of Public Affairs votes to accept Ohio Power's bid of $141,760 for city's municipal power plant and distribution system.

Off the Washington Wire—Congress authorizes spending another $75 million for three big power dams in the Columbia Basin—Detroit Dam, Lookout Point, and The Dalles. Bill must still be signed by President.

Senate Appropriations Committee has raised REA new loan authorizations to $180 million for next fiscal year. This includes both regular loan fund and contingency fund.

Senate subcommittee on Interior appropriations was readying a report last week making these recommendations: (1) Sepa be allowed to dispose of its controversial Clark-Hill-Greenwood, S. C., transmission line; (2) BPA absorb a share of abnormal steam generation costs in its service area; (3) Interior be given a $445-million appropriation for the fiscal year beginning July 1—a boost of $39 million over amount voted by House; (4) USBR funds be upped to $121 million for next fiscal year—an increase of $13 million over amount approved by House; and (5) BPA operation and maintenance funds be increased $7.8 million above House-approved figure of $5 million.

Tornado damage to utility facilities in Midwest and New England last week was confined mainly to transmission and distribution lines. Service was restored in most cases within 24 to 48 hours.

Consumers Power, serving Flint, Mich., area, reported a few towers and some high voltage transmission lines downed. Local distribution systems in the worst affected areas were knocked out.

In early estimates of damage, Cleveland Electric Illuminating, declared at least 240 electric poles were toppled and many lines down. Lightning put a number of the company's transformers out of service.

In New England, NEES, which serves the hard-hit Worcester-Shrewsbury area, estimated tornado damage to its facilities at not more than $100,000. Worcester County Electric, NEES subsidiary, reported poles downed and distribution lines out. NEES high voltage lines in the storm area also were damaged with 12 steel towers demolished.

New Jersey P&L asks Board of Public Utility Commissioners approval to raise $1,238,000 in surcharge rates, starting with July 15 bills. Surcharges will be dropped under the plan when the full amount is raised . . . Idaho Power asks PUC approval for a 2% rate hike to cover a proposed 2% franchise tax by the city of Ontario if it is invoked.

Congratulations—Niagara Mohawk Power elects Charles A. Wick vice president . . . Jefferson Electric names John D. O'Brien vice president in charge of sales . . . B. L. England, president of Atlantic City Electric, gets honorary Doctor of Engineering degree from Bucknell University . . . Duquesne Light elects following vice presidents: Walter J. Lyman, Ralph R. Parkman, and Carroll T. Sinclair.

GORDON DEAN, chairman of Atomic Energy Commission (left), is shown with Walter H. Sammis, new EEI president, after Dean told the convention U. S. has been successful in "breeding" atomic fuel

COFFIN AWARD is presented by Ralph J. Cordiner (center), president of General Electric Co, to J. W. McAfee, president of Electric Energy, Inc. Bayard L. England, EEI president, looks on at left

Sammis Plan: Curb Federal Power

New head of EEI tells convention he will work for eventual elimination of government from electric utility business

A program intended to reduce government activity in the power field and eventually to get the government out of the power business entirely was outlined by Walter H. Sammis, new president of Edison Electric Institute, at the closing session of EEI's 21st Annual Convention in Atlantic City.

At the same session, Gordon Dean, retiring chairman of Atomic Energy Commission, announced that the commission's Experimental Breeder Reactor at Arco, Idaho, had successfully demonstrated that "breeding" within a nuclear power plant was possible. The reactor, he said, is operating in such a way that it is burning up uranium 235 and in the process, changing non-fissionable uranium into fissionable plutonium at a rate that is "at least equal to the rate at which the uranium 235 is being consumed." (Abstracts of speeches delivered at convention begin on page 102.)

Five Points . . . Sammis, president of Ohio Edison Co, outlined an individual five-point program for the electric industry in accepting his election to the presidency of the industry association. He said he would:

- Endeavor to get from the federal government for both investor-owned companies and government-owned power agencies equal opportunity for buying power from government dams and equal imposition of taxes.
- Endeavor to stop further expenditures by the federal government for the building of power plants and transmission lines which business-managed electric companies are willing to build.
- Endeavor, where feasible, to get the federal government out of the power business as this becomes practicable.
- Endeavor to further cooperative efforts between the industry and Atomic Energy Commission in development and use of atomic power "for the general welfare of all the people."
- Endeavor to foster a greater spirit of community service and area development on the part of the electric companies, including the big task of making electricity do more for agriculture.

Before his election, Sammis was vice president and a director of the institute. He was succeeded in the vice presidency by Harold Quinton, executive vice president of Southern California Edison Co.

Sammis began his career at Consumers Power Co in 1920, after serving 28 months in the Navy. He worked for various power firms until 1932, when he was elected a vice president and director of Consumers. The following year he was named to serve in the same capacities for Ohio Edison and Pennsylvania Power Co. He was named president of Pennsylvania Power in 1936. Two years later he became a vice president and director of Commonwealth and Southern Corp. In 1944 he accepted the presidency of Ohio Edison, and in 1950 became chairman of the board of Pennsylvania Power.

Quinton has been an officer of Southern California Edison since 1942 when he was elected vice president in charge of finance.

The Awards . . . This year the Charles A. Coffin Award, highest honor made annually to a power company, went to Electric Energy, Inc, for its "brilliant and bold conception" in pioneering a coalition of power companies to supply a record amount of power to AEC's new plant near Paducah, Ky.

Ralph J. Cordiner, president of General Electric, the sponsoring com-

pany, made the presentation to J. W. McAfee, president of the five-company coalition and of Union Electric Co of Missouri. Beside Union Electric, the companies participating in EEInc are: Central Illinois Public Service Co; Illinois Power Co, Kentucky Utilities Co and Middle South Utilities, Inc.

The award citation pointed out that a pattern had been set by EEInc for similar coalitions of electric utilities to supply quantities of power larger than any one utility could supply alone. It cited Electric Energy for "its contributions to national defense, its superb example of competitive enterprise, and its demonstration that American industry can take the long view in adapting itself to the new age."

Hero of Fire . . . Matthews Valor Award went to William A. Cripps, electric repair leader of Pennsylvania Power & Light Co, for heroically fighting a substation fire last October. A 66-kv oil switch at PP&L's Shenandoah substation failed and caught fire in a flash-over. While the substation operator tried to isolate the burning switch, Cripps single handedly attacked the blaze despite the imminent danger of a second flash-over.

The PP&L crew leader exhausted all available fire extinguishers and then resorted to throwing dry chemicals on the fire by hand. His action kept the fire under control until additional equipment could be secured from other PP&L locations. Cripps' efforts prevented partial loss of the substation structure and made possible the quick restoration of service to the area.

Report Cited . . . Arkansas Power & Light Co copped the Reddy Kilowatt Annual Report Award for a simple, human presentation of its operations and policies.

Contest judges commended Arkansas P&L report for discussion of service-area development, "including progress in agriculture, industry, and better living," and for pictorial illustration of the company's program for improving service throughout its territory.

The report was also cited for its explanation of "employee activities, benefits, and contributions," and for spelling out "progress along several fronts in combating government encroachment in the area served."

Start on Atomic Reactor Urged

Rep W. Sterling Cole, head of Joint Atomic Energy Committee, calls for immediate construction of power-producing unit

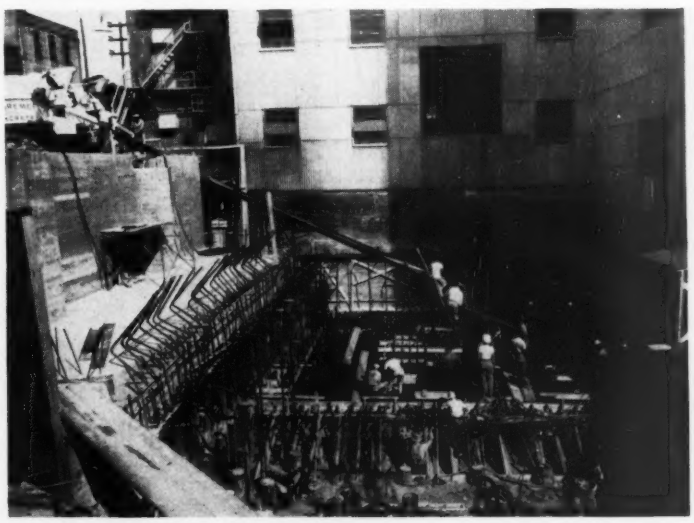
Rep W. Sterling Cole, chairman of Joint Congression Committee on atomic energy last week called for a prompt start on construction of a power-producing atomic energy reactor.

Cole's demand came shortly after Gordon Dean, chairman of Atomic Energy Commission, announced at the Edison Electric Institute Convention that AEC had been successful in breeding atomic fuel. Significance of the development lies in the fact that the atom now rates as the most plentiful source of energy yet harnessed by man. (Highpoints of Dean's speech appear on page 103).

"The time has come," Cole said, "to get a full-scale power-producing atomic reactor out of the research and development stage and into the construction stage.

"In the long run, a flourishing atomic power industry must draw its strength from the genius and skill of American private industry. But if private industry, using private funds, is not ready to do the job, I believe that the Atomic Energy Commission with government money, should immediately undertake the construction of a prototype power-producing reactor . . ."

Jab at Economizers . . . Cole's remarks obviously were aimed at economizers in the Eisenhower Administration and Congress. Administration budget makers refused to permit AEC to ask Congress for funds to build an experimental atomic power plant. And the House Appropriations Committee was showing signs of trying to stop work on the recently started Portsmouth, Ohio, plant of AEC. Without Portsmouth's anticipated production of U-235, there's scant chance that atomic fuels



Savannah E&P Extending Station

Work is in progress on an extension to the turbine room of Savannah Electric & Power Co's Riverside Power Station. Work includes installation of a 20,000-kw preferred standard turbo-generator and 220,000 lb per hour boiler with pressurized furnace. New unit, scheduled for operation in July, 1954, will bring company generating capability to 80,000 kw.

can be spared from military use for power plants in the foreseeable future.

Cole also knocked in the head rumors that the military was opposed to a diversion of fissionable materials for fueling commercial power plants.

After a session with representatives of the Joint Chiefs of Staff, he announced that the JCS "endorsed the rapid development of atomic power, consistent with military requirements for fissionable materials."

Cole's committee already has started hearings behind closed doors on the AEC's proposals to amend the McMahon Act. The committee plans to open these sessions to the press and public in a week or so.

There's little chance the economizers in Congress will give AEC upwards of $10 million for an experimental power plant this year. But the stage will be set for such a grant next year. That's about the time when the joint committee expects to have legislation for changing the McMahon Act ready for a vote in Congress.

Utilities Rap Development of Niagara by N. Y. State

The five power companies in New York State oppose state development of hydroelectric power from the Niagara River as vigorously as they oppose federal development. That was made clear by a statement of principles issued this month by the companies.

"Fundamental issue is unchanged and is solely a question of free enterprise v. government ownership," the companies stated. "Government, neither federal nor state, should enter into any business undertaking which does not involve traditional functions of government, when private enterprise is ready, willing, and able to undertake such business functions."

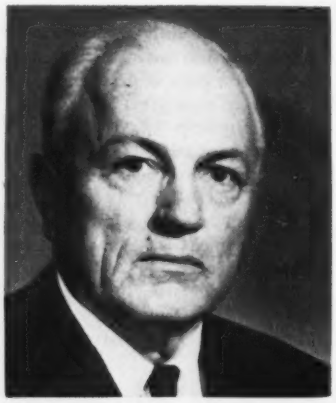
Development by the state, it was pointed out, would place power producing facilities under control of a politically appointed agency and appointment of members would be subject to "the control and uncertainties of partisan politics."

The companies countered the contention that public development is dictated by New York State laws. They singled out the 1938 state constitutional convention during which efforts to write a provision favoring such policy were defeated.

At that time Charles Poletti, a delegate at large, introduced a proposal declaring that the water power resources of the state:

". . . shall always remain inalienable to, and ownership, possession, and control thereof shall always be vested in the people of the state and the state shall neither lease, sell, nor transfer these properties and rights other than to a public corporation or other public agency."

The proposal was debated at great length, the statement continued, after which "it was decisively defeated."



ELGIN B. ROBERTSON

. . . New AIEE Head

Elgin B. Robertson, president of Elgin B. Robertson, Inc, has been elected president of American Institute of Electrical Engineers for 1953-54. Announcement of the election was made at the association's summer general meeting being held this week in Atlantic City.

Robertson succeeds Donald A. Quarles as president.

AIEE also elected the following vice presidents: Walter B. Morton, Pennsylvania Power & Light Co, Middle Eastern District; C. P. Almon, Jr, Tennessee Valley Authority, Southern District; A. S. Anderson, General Electric Co, North Central District; George C. Tenney, "Electrical West," Pacific District; and G. D. Floyd, Hydro-Electric Power Commission, Canada District. They will also serve as chairmen of their districts.

The new president and vice presidents will take office Aug. 1.

No REA Changes . .

. . . will be made without consulting Congress, Benson says as he gets power to reorganize Agriculture Dept.

Plan to reorganize the Agriculture Department, including a possible shakeup of the Rural Electrification Administration, has cleared both houses of Congress.

A two-thirds majority vote by either house of Congress would have killed the plan. The House let it become effective without a vote. Earlier the Senate failed to muster the necessary majority to scuttle the plan despite strenuous opposition by Democrats headed by Sen Richard B. Russell of Georgia.

The reorganization plan submitted by the Eisenhower Administration would permit Agriculture Secretary Ezra Taft Benson to reshuffle six of the 20 agencies of the department. He already has similar authority over ten other agencies and four are completely exempted.

Full Consultation . . . Under the new plan, Benson theoretically has broad authority to reorganize REA, but he promised lawmakers that he would make no important changes without full consultation with Congressional committees concerned. Debate in the Senate indicated that without this assurance, the plan would have had much tougher going.

In testimony before a Senate committee, the Agriculture Secretary denied any present intention of broad changes in REA. Asked specifically what were his plans regarding the agency, Benson replied:

"I certainly have not reached any conclusion that any of the important functions of REA would be distributed to other agencies. I have been intensely interested in the work of REA."

Earlier Proposed Changes . . . The former Truman Administration asked for similar authority in 1950, but was turned down by Congress. Among the changes then proposed was the change of REA's name to Rural Electrification Service and possible integration of some of its functions with those of other agencies all ready established.

FPC Fixes Roanoke Pool Level

Commission orders Vepco to pay government $250,000 a year for benefits derived from Kerr Dam upstream

Federal Power Commission has quietly answered one of its severest critics on the Supreme Court—Justice William O. Douglas who issued a blistering dissenting opinion in the Roanoke Rapids case (EW, March 23, p 108).

Mild but direct reply came in an FPC order fixing the pool level of the Roanoke Rapids projects now being built under a federal license by Virginia Electric & Power Co on the Roanoke River.

Major portion of the order deals with the contribution which the upstream federal Kerr Dam will make to power production at the Roanoke Rapids project. FPC said engineering studies show storage regulation at the Kerr project will contribute on the average about 70 million kwhr of additional power output a year at the Vepco plant.

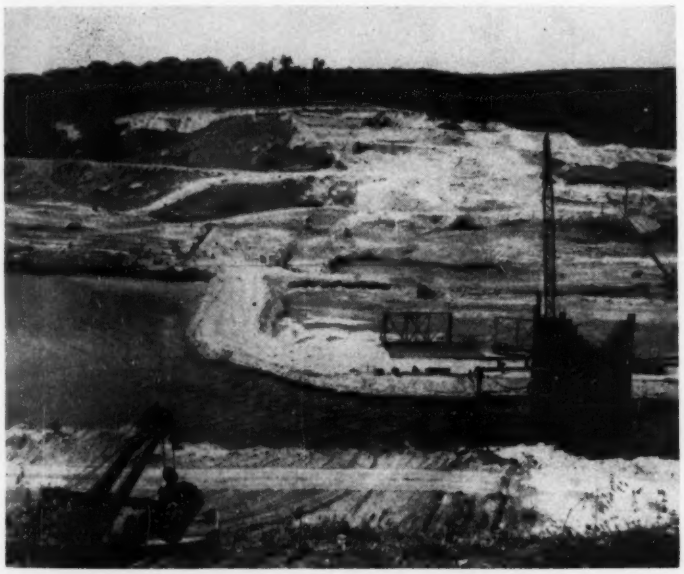
Payment Determined . . . "Since this cannot add to the dependable capacity of the Roanoke Rapids plant, it will have only fuel replacement value on the Vepco system," said the commission. It figured this would amount to about 3.79 mills per kwhr or a little over $250,000 per year. Under terms of the license, Vepco is required to repay the government for this contribution of energy.

These findings contradict Justice Douglas' opinion in which he asserted that private power groups at Roanoke Rapids will be appropriating energy worth more than $700,000 a year supplied by Kerr Dam and Reservoir.

It was upon this argument that he concluded, "the master plan now becomes clear: The federal government will put up the auxiliary units—the unprofitable ones; and the private power interests will take the plums—the choice ones."

Pool Level Fixed . . . In the order, FPC fixed the normal operating pool level at the Roanoke Rapids Dam at 132 ft above mean sea level. This was five ft above the level originally contemplated by the Corps of Army Engineers when it drew the comprehensive plan for the basin. FPC said the higher level will permit the plant to operate with greater flexibility, which is highly desirable in the operation of most hydroelectric plants. It will also make it easier to fulfill streamflow requirements in the lower river.

But the higher level of the Roanoke Rapids pool will mean a relocation of the Gaston hydroelectric site about 9,000 ft upstream from the location chosen by the Corps of Engineers. This site is between the Kerr project and the Roanoke Rapids site. Vepco has an application pending before FPC for construction and operation of the Gaston project.



Connecticut L&P Launches Work on Dam

Excavation is nearing conclusion on Connecticut Light & Power Co's Shepaug Dam on the Housatonic River, near Danbury, Conn. Pouring of more than 220,000 cu yd of concrete will begin next month. Interlocking sheet steel piling of cofferdam (right center of photo) is being pounded into position. The $13-million structure, 1,400 ft across, will have a generating capacity of 57,000 hp and a generator capable of producing 37,250 kw. The lake resulting from the construction will cover 1,870 acres and have a depth of 103 ft at the dam site. Seven control gates will handle water up to the mass of a 1936 flood, worst in the recorded history of the Housatonic.

'Watchdog' Committee to Keep Eye on Interior

"Watchdog" subcommittee to keep an eye on Interior Department policy has been named by the House Interior and Insular Affairs Committee.

Headed by Republican Rep John R. Pillion of New York, the subcommittee is directed to oversee administration policy, to carry on necessary investigations relating to the department, and to maintain liaison with department officials.

The subcommittee was created in conformity with the Congressional Reorganization Act of 1946 which recommends standing subcommittees for these purposes.

Members other than Chairman Pillion are: Republican Representatives Craig Hosmer, California, and George H. Bender, Ohio, and Democratic Representatives Ken Regan, Texas, and Leo W. O'Brien, New York.

St. Lawrence Hearings Start

FPC begins hearing testimony of parties opposing granting license to New York to develop river's power potential

Federal Power Commission is scheduled to hear arguments today, June 15, in opposition to granting a license to the Power Authority of the State of New York for construction and operation of the St. Lawrence power project.

FPC Examiner Glen R. Law recommended that the license be issued, but his decision is subject to review by the full commission (EW, May 18, p 128).

In his recommendation that New York State be licensed to carry on the project, Law turned down a conflicting application by Public Power & Water Corp of Trenton, N. J., on the grounds that the concern had not presented a superior proposal and had not shown financial ability to construct the project.

Exceptions Filed . . . The commission, in scheduling oral argument, said that exceptions to the examiner's decision "have raised many issues of law and fact with respect to the denial of the application for license (by) Public Power & Water Corp. . . ." H. A. Splanski, president of the Trenton company, filed the exceptions on behalf of his company.

Exceptions to the examiner's decision were also filed by organizations representing coal, ports, and public power interests. National Rural Electric Cooperative Association and Public Power Association are asking that a "preference clause" provision be written into the license granted by the commission.

Coal groups oppose the granting of the license on the grounds that it would be in conflict with their interests as suppliers of coal for potential electric generating plants in the area.

Central Pennsylvania Coal Producers Association may threaten to take the matter to court if the commission decides to issue the license in spite of protests.

While it appears certain that FPC will finally go along with the examiner's decision, the commission will take every precautionary step to make sure its decision will stand up under a court test.

Hawthorn Station Delivering an Extra 110,000 Kw

Kansas City Power & Light Co's Hawthorn Station, pictured above at night, is turning out an additional 110,000 kw. The plant's big No. 3 unit went on the line June 2. A fourth unit of similar size is scheduled for completion early in 1955. Hawthorn's units No. 1 and 2 have a capacity of 72,000 kw each.

POWER BRIEFS

• Consolidated Edison Co of New York has reported that its load on June 2, the day of the coronation of England's Queen Elizabeth II, was 60 Mw higher than normal from 4-6 pm and 130 Mw higher from 11-12 pm. Higher peak loads have been recorded on other occasions, however, Con Edison noted.

• Virginia Electric & Power Co dedicated its new 105,000-kw Portsmouth Plant last month. Company Pres J. G. Holtzclaw announced a second unit of 105,000 kw would be installed at the plant and would be completed at the end of 1954.

• Southern California Edison Co has started construction of a second plant at its Redondo Steam Station. The plant will consist of two generating units of 156,000 kw each, first of which is scheduled to go on the line in the spring of 1954. Upon ultimate completion, the station will consist of two plants with a total capacity of 600,000 kw. First plant was completed in 1949 and contains 288,000 kw in four units.

• Seattle City Light, having reached an agreement with the government of British Columbia, has started clearing a 600-acre tract across the border. When completed about July 1, the area will give 1.4-million acre-ft of storage behind Ross Dam and extend the lake one and a half miles into Canada.

• Latvia's vast peat bogs are providing fuel for generating plants there, according to Radio Moscow broadcasts. Special furnaces are now in operation.

Hoisting Generator Shell into Place

Installation work is under way on an additional 66,000-kw high-pressure steam turbine generator at the Zuni power plant of Public Service Co in lower downtown Denver.

One of the biggest tasks was accomplished with the raising of a 122-ton generator shell from a railroad flat car into position 30 ft above. It is housed in a new addition at the Zuni plant, which will have a capacity of 110,000 kw when the new unit goes in operation about a year from now. A 44,000-kw high-pressure steam turbine generator was installed at the Zuni plant in 1948.

The new generator will be the largest in Colorado. It cost $1.5 million and was manufactured at the Westinghouse plant in East Pittsburgh, Pa.

The total cost of the Zuni expansion project is $11,675,000. Construction work started in November, 1951.

Gatchell Is Appointed FPC General Counsel

Willard W. Gatchell, staff expert on federal power law, has moved up to the top legal post on the Federal Power Commission.

He took over as FPC general counsel June 2 replacing Bradford Ross, a Democratic appointee who resigned upon change of administrations.

Gatchell has been a member of the legal staff of FPC since 1931. Since 1947 he has been assistant general counsel in charge of hydroelectric matters.

In his new position, Gatchell will boss all staff legal work, the majority of which pertains to administration of the Natural Gas Act. However, he will probably continue to work on cases in which he already has a part such as the St. Lawrence Power Project application.

Gatchell recently was prominently mentioned to fill a vacancy on the Commission, itself (EW, March 2, p 6).

However, he lost out to Jerome K. Kuykendall. Another vacancy will occur June 22 upon expiration of the term of Harrington Wimberly, an Oklahoma Democrat.

Other items in the week's news will be found starting on page 260.

Let's Eliminate Unfair Competition

These pages and those following through Page 111 carry abstracts of speeches delivered at the 21st annual convention of Edison Electric Institute, June 1-4, at Atlantic City.

B. L. ENGLAND

President,
Edison Electric Institute

Today the electric industry in the United States has great opportunities and along with these opportunities much greater responsibilities. Much has been said about the way our industry has been undermined by the growth of socialistic policies and the 20 years of attacks by proponents of government power. But I, for one, believe we grew strong, we recognized our weaknesses and are facing the future with a greater understanding because of these opposing forces. We know that the answer to "cheap government power" is cheaper, more reliable, less political, more businesslike, and more imaginative private power. Our companies have never been financially stronger, service-wise more capable, and earnings-wise more attractive than they are today.

I think it can fairly be said that there is a growing realization throughout this country, particularly in the West, that local planning and local responsibility must have a dominating role in the development of natural resources.

I believe that any fair-minded person who will inform himself of all the facts must agree with the conclusion that the federal government in its legislation, its regulations, its interpretations of laws and regulations, and its administration of them, and in its judicial proceedings has heavily discriminated against investor-owned power companies and has fostered the nationalization of electric power. Many eminent persons in the past year, including President Eisenhower and former President Herbert Hoover have stated the case.

A Lack of Fairness

In competing with private business there are several weapons which the federal government uses. Two of these are important: (1) tax discrimination and (2) selling power below cost to preference customers. Investor-owned power companies, and therefore their customers, are heavily taxed to support the government. At the present time they are paying 14% of gross revenues to support the federal government and 9% to support local governments. It is grossly unfair to the customers of power companies for them to be taxed through their power bills to support the government and then for the government to exempt by law from taxation those customers who obtain their power from local and national governmental proprietary business.

Furthermore, the proprietary power business of most governmental agencies has the unfair advantage that interest on the bonds sold by them to provide money for this business is also tax exempt, a fact that materially reduces the interest rate on such bonds.

The practice by federal agencies of selling power below its real cost and thereby forcing federal taxpayers to subsidize part of the power bills of the consumers of the underpriced electricity is widespread and has been recognized from its beginning. If power were sold to cover the true cost to the Treasury, including an amount equivalent to the federal taxes that would be paid if the property were investor-owned, in most instances the cost of federal power would equal or exceed the fair market value of power as established by the production cost from other power sources in the area.

The proponents of these discriminatory practices argue that the public resources should be developed for the benefit of the public and not for private profit, but, in all fairness, who but the public benefits if the power is sold to regulated investor-owned companies? Any savings in cost to the company due to purchases of low-cost power go to the customers the company serves. Their tax money has helped build the projects. Surely there is no fairness in a provision that denies to certain classes of American citizens a government subsidy extended to another class. This is what we mean by unfair competition, and legislative changes are needed to correct the lack of fairness.

The issue here is much broader than the power industry. The federal government has entered into other fields of business. A threat to nationalize and destroy any American business or industry is a threat to destroy the free enterprise in all American business and industry. The free enterprise system is efficient, vigorous, and resourceful. But certainly the power to tax is the power to destroy. Big government is bigger than any industry and if the basic inequities I have pointed out are not corrected, the government will wind up by nationalizing many of our basic industries in America, and through them will effectively dominate practically all business and industry.

While we are asking for fair competition, let us be sure that we give fair competition in return and that we go even beyond the actual requirements of regulation and law to assure this in our business dealings with neighboring municipal and co-op systems. They are not charity subjects and can and should pay their way like any other proprietary business. But we can be helpful to them. They can be helpful to us. They are our neighbors and let us see to it that we are sound and fair in all our dealings with them. It will become apparent to them that in reality we are their best friends.

In another area, sales of electricity have been running well ahead of last year. Latest reports of the Power Sur-

vey Committee make it clear there will be an adequate supply of power throughout the coming year in all parts of the country, except possibly in the Pacific Northwest, if there should again be an adverse hydro season such as occurred last fall.

Electrical manufacturers advise they will deliver 12.5 million kw of generating equipment this year. About 10 million kw will be put in operation during 1953. Our survey shows the entire industry will add about 30 million kw between 1953 and 1955. Not only will we have ample capacity in the years ahead of us, but plainly we have a big selling job to do if we are to make the most of the commercial opportunities that confront us.

Area Development Needed

Part of this opportunity is in development of the areas power companies serve. A utility can grow no faster and prosper more than the territory it serves.

There is no magic in the power company's contribution to area development. It has no money to squander on popular ventures. To carry out its functions in serving agriculture, commerce, and general industry it must have trained personnel who continuously are engaged in planning and men who are thoroughly acquainted with the territory and its possibilities and know how to put electricity to work to earn more for the customer.

In recent months there has been a substantial increase in interest rates on long-term debt. Because the electric power industry is pre-eminent among industries in the amount of capital it requires and the slow rate of turnover capital, the interest rate on bonds is very important in its rate making and financial problems; and this change is a matter of concern to all of us. Rate increases obtained during the past few years to offset rise in the cost of labor and materials were based on the cost of money then prevailing. It becomes critically important that public service commissions give adequate consideration to changes in the cost of money if we are to carry forward the large construction program we are in the midst of.

In the long run, however, it is important to all free enterprise that thrifty and industrious people be given incentives to save and invest their savings with confidence in the future buying power of the dollar. This change is in the direction of sound and fair treatment of the investor, and we should clearly understand the significance of this point. Investor-owned companies spent about $2.6 billion in 1952 and at present construction rates it would appear they will spend about $3 billion in 1953.

These are great days in the history of electric power. I believe that we are alert and are measuring up to our opportunities and our responsibilities, but this is no time for self congratulations. We have great work to do, great decisions to make, important policies to establish, much commercial development work to accomplish, awe-inspiring engineering opportunities ahead, heavy responsibilities and important decisions in the matter of finance, questions that tax our capabilities in relations with the local and federal governments and with the public generally.

If we do this work well, we will promote the interests of our investors and employees, and we will advance the interests of America and of free enterprise.

GORDON DEAN

Chairman,
Atomic Energy Commission

Breeding of Fuel: New Atomic Milestone

We have reached another milestone in the history of atomic energy development in this country. It is one which holds out promise of making a civilian atomic power industry even more feasible and attractive in the long range than it has hitherto appeared to be.

Dr Walter Zinn, Dr Harold Lichtenberger, and their associates at Argonne National Laboratory in Idaho have used the reactor to demonstrate successfully the principle of breeding. The reactor is operating in such a way that it is burning up uranium-235 and, in the process, it is changing non-fissionable uranium into fissionable plutonium at a rate that is at least equal to the rate at which the uranium-235 is being consumed. Breeding has been achieved and Dr Zinn and his colleagues are to be congratulated.

Much to be Done

We must take care to see that this encouraging development is kept in its proper perspective. This news does not mean that economic power from atomic fuels is here.

This achievement does not mean we are suddenly independent of raw uranium ore. Breeding is a slow process and a reactor may have to operate for five years or longer before it succeeds in yielding as much new fuel as was initially invested in it.

Real significance of breeding is that it is now possible for mankind ultimately to utilize all of the uranium that can be extracted from the earth's surface for atomic fuel whether it is fissionable or not in its natural state. It is another important factor which can be introduced into the many calculations being made to determine the best technical and economic approach to competitive atomic power.

In line with the progress that has been made to date, the AEC now feels that the Atomic Energy Act of 1946 should be modified to permit:

- Ownership and operation of nuclear power facilities by groups other than the Commission.
- Lease on sale of fissionable material under safeguards adequate to assure the national security.
- Use and transfer of fissionable or by-product materials by the owners of reactors, subject to purchase or regulation by AEC in the interest of health and safety.

The Commission has also proposed that the suggested changes be accompanied by adjustments in the Commission's own practices to permit:

- As appropriate, the granting of more liberal patent rights in accordance with existing law.
- A progressively more liberalized information policy in the power reactor field, as justified by need and as permitted by security considerations.
- The performance in Commission laboratories of such research and development work in the power field as is deemed warranted in the national interest.

The Commission has not proposed any change in the patent provisions, but this question is now under study. In this regard, I think there are two objectives.

- I don't think anyone should be allowed to come into the atomic power picture with the investment of a dollar or two and walk off with patents worth hundreds of millions of dollars.
- I think people who come into the power program and make a real contribution based on a liberal investment of talent and money involving a real risk, should be entitled to some patent rights denied to others.

Right now our objective is to advance our atomic power technology to the point where it can compete with the "horse" that is coal, gas, and oil. But that is just the beginning. I know, and I think that we all know, that there is more in the atom than that.

WALKER L. CISLER

President,
Detroit Edison Co

Private Industry Must Help Develop Atom

We are approaching the point where the use of atomic fuels for the generation of electric power may be possible on a competitive commercial basis.

The nature of the energy from nuclear fission has been more clearly established, and some of the problems of utilizing this energy for peacetime civilian and industrial purposes are reasonably well understood. The one practical use of the heat available in atomic fuels now appears to be the generation of steam, which could then be used either for industrial heat processing or for the generation of electric power.

It follows that the electric power industry has both a major interest and responsibility in this development. Development and construction of full-scale reactors for generation of power might be carried out by (1) private industry using private capital, (2) the government, presumably by AEC, using government funds, or (3) by some joint venture involving private industry and government.

In an economy like ours it is the responsibility of private industry to develop new scientific discoveries and to make the benefits available to all the people. While atomic energy has unique properties and far-reaching implications, fundamentally it is a new resource to be developed and put to work. This clearly is the responsibility of competitive industry. As the most promising use of atomic energy is in the generation of electric energy, the electric power industry has great responsibility and great opportunity in this situation.

The Industry's Responsibility

Proposals for joint ventures with government of various kinds have been proposed. It is fair to indicate there must be some mutual aspects to any development. Certainly it will be necessary to use the results of research that has already been completed in our national laboratories.

Atomic development should be carried forward on two broad fronts: one involving those matters of primary importance to government, and the other matters of greatest concern to industry. There should be the closest cooperation and coordination between the two to avoid duplication and to assure maximum results.

When the present study phases are completed, and if these indicate that use of nuclear fuels might be competitive, the power industry should actually carry out construction and testing of full-scale reactors. This will require substantial sums of money, but this should be regarded in the same light as research and development efforts that have been carried since the beginning of the industry.

If proper effort is exerted, initial projects could come into service within 10 years, perhaps somewhat sooner. Succeeding installations should be improved, and it is within reason to expect proven workable installations within 10 to 15 years. Because the power industry will be responsible, it should assume the costs of development.

Any organization investing capital in a plant to use atomic fuels would need to know that it could have full control of the plant. The organization would need to know that it could obtain necessary atomic materials for fuel and that it could sell or dispose of fission products through the normal channels of commerce.

To bring this about, the Atomic Energy Act of 1946 should be amended to permit private enterprise to:

- Build, own, and operate atomic energy plants.
- Acquire, own, and dispose of fissionible materials.
- Acquire, own, and dispose of source materials.
- Use, sell, and distribute end products and by-products produced in an atomic energy facility.
- Obtain license from AEC subject only to the requirement that operations thereunder be conducted in compliance with conditions set forth in the license in accord with standards to be prescribed by the act.
- Attain normal patent and trade secret protection subject only to full disclosure to AEC for its own use for purposes of protection of national security.

Better Regulation Necessary

EUGENE S. LOUGHLIN

President,
National Association of Railroad and Utilities Commissioners

The importance of sound utility regulation to the public generally, to the industries regulated, to the investors, small and institutional, and men who guide them, is simply that it has succeeded in preserving for America a free and privately owned utility and transportation system.

More far-reaching than even changes in national power policies would be the development of better regulation of utilities, properly divided between federal and state responsibilities, to the point of strengthening public and investor confidence. For without sound regulation there can be no really healthy regulated company and without good corporate health, the service to the public will suffer.

As for the proper organization and function of a utility commission, the best answer seems to be that the customer is entitled to aggressive protection of his interest while the utility and its investors are entitled to an equally responsible and impartial tribunal.

The commission that misconceives its position and presumes that its principal purpose is to oppose the industry can do no one any good. If it becomes so persuaded of the infallibility of management or is so inadequately staffed that it is unable to question the policies of companies, injury to the public and investor, although indirect, is no less serious.

The price consciousness of the consumer is not nearly so acute if he has had demonstrated to him by a history of efficient service that his company is a dependable company.

Experience demonstrates a ratepayer's concern over a price rise is much more acute where service is poor, that his concern with service outlasts his concern over higher rates. It is the vagaries of uncertain voltage, a flickering television set, a burnt-out motor that are their real concerns.

Because commissions are called upon in each jurisdiction to regulate billions of dollars of investment and to control expenditures of ratepayers' dollars that amount to millions, the industry can assure its continued prosperity and the confidence of its customers by lending its weight to achieving a uniformly improved utility regulatory climate throughout the 48 states and the territories and insular possessions.

D. W. TRACY

President,
International Association of Electrical Workers

Labor Has Interest In Free Enterprise

Labor and management generally recognize that each has a permanent and proper place in the industry and have a contribution to make. A mutual relationship exists between interests of management and labor in the electric industry and there has been an encouraging development of harmonious relations.

The great bulk of American labor fully supports the principles of our free enterprise system, based on the bonafide belief that the system is in its own best interests. American labor has viewed the problem of communism on a world-wide basis and has extended its battle against the enemy into foreign countries.

The system cannot be a one-way street. Collective bargaining is a basic requirement to permit it to operate in a manner fair to management and labor. There are some in management, even in this industry, who do not understand this. We in labor believe that we serve not only our own cause but also the free enterprise system, when we make efforts to establish collective bargaining with precedures with such employers.

This is the historic position of labor toward free enterprise. It is entirely logical, therefore, that IBEW should oppose the further extension of public ownership in the electric industry. It has become more apparent that the advocates of public power are no longer content with the program endorsed originally by the American people and have sought to go far beyond that program, advancing proposals which would supplant free enterprise with government ownership.

It cannot be denied that public power came into being because private power was not doing the job demanded by the American people. That charge is not valid today. Private companies for the most part recognize the necessity to render adequate service at fair rates. As long as they continue to do so they will merit and receive the support of the consuming public.

EEI Panel Discussion . . .

Financial Outlook for Public Utilities

F. W. PAGE

Vice President,
Tri-Continental Corp

Price-Earnings Ratio Vital

In selecting common stocks in the utility industry, it is wise to look for:

1. Price earning ratio
2. Confidence
3. Growth per share
4. Vulnerability to special developments.

A normal ratio of a company is to sell 12 to 15 times earnings; 18 times being high, and 10 times is so low that you can buy them with your eyes closed.

The investment companies I represent have total assets of $240 million of which a small part is invested in bonds and preferred stocks. One-third of the bonds and preferreds is in utilities and we are being attracted more and more to them by the new level of interest rates.

Utility common stocks account for about 25% of the total common stock investments. This is the largest commitment these investment companies have in any one industry.

In the last three years the demand for common stocks in the utility industry has been so great that they continued to rise—and yields decreased—until about two months ago when the increasing yields available on bonds and preferreds first began to affect the common stock market.

In the last two months many utility common stocks are down 10 to 15% from their highs and the drift continues downward. The industry should make changes in financing methods to reflect the changes in the money market situation from the old government-regulated situation under the New and Fair Deals.

The industry will have to pay more for future capital requirements. To help overcome this:

- Arrange for negotiated sales of securities rather than sell them competitively.
- Make direct offering of common stock rather than through rights to stockholders.
- Fight for higher rates where needed to obtain better rate of return on new plant.

ARNOLD R. LoFORCE

Second Vice President,
Metropolitan Life Insurance

Adopt Non-Callable Bonds

We should look for no significant decline in interest rates; in fact they might even move somewhat higher before they stabilize.

This trend to higher interest rates is most important to public utility companies—not only from the standpoint of the higher cost of senior capital but also equity prices, since common stock yields in many cases do not seem particularly attractive in view of the higher returns available on senior security issues.

Under the circumstances, in order to hold down the cost of senior capital it would seem that consideration should be directed to the following:

- Adopt more realistic call prices and non-callable bonds for refunding purposes for 10 years. This will reduce interest rates ⅛ to ¼ of 1% and allow utility bond offerings to more effectively compete with industrial debt financing.
- Consider use of debentures instead of preferred stock. In many cases debentures can be soundly used and represent a lower cost medium of attracting capital particularly when the impact of taxes is considered.

ALBERT H. GORDON

Partner,
Kidder, Peabody & Co

Negotiated Sales Preferable

Savings banks and pension funds are generally more avid purchasers than they have ever been of AAA and AA bonds around a 3.75% basis. As the supply of these is limited, the success of their offering is a matter only of price, for the pension funds are still increasing rapidly.

EDWARD T. McCORMICK

President,
American Stock Exchange

New Equity Sources Must be Sought

I direct my remarks to the increasingly significant and difficult problem of raising new equity capital.

Seasoned corporations have, to a great extent, been able to provide equity for expansion, higher cost replacement, and other needs out of accrued earnings, from depreciation and other like sources. Even here the highest tax burden in our history has cut into earnings which otherwise might be accrued.

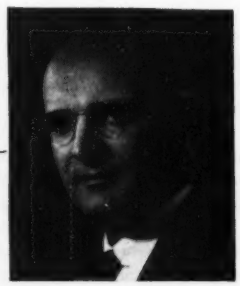
Because of the increasing tax burden, the old wellsprings of venture capital have been drying up, and it has been necessary to search for new sources. Higher income groups have found that that portion of their earnings which otherwise might be invested in new enterprises, or for expansion, has been taken by the tax collector. Excess investment funds are finding their way into tax-free and tax-sheltered investments.

Perhaps the largest untapped source of fresh equity money is in the hands of the lower and middle income groups. While some members of this group hold securities, directly or indirectly, by far the greater number are not and are indifferent toward purchase of common stocks.

Combatting such indifference presents a difficult and challenging task that will call into play all educational and psychological talents. Those who can afford to buy should be informed that equities provide not only an appropriate but advantageous means of investment in combination with insurance, government bonds, etc.

We cannot by ourselves remove the impediments to such investment. Part of the burden must be borne by the federal government, which should take the following steps to make equity investment feasible and attractive:

- Reduction of individual taxes
- Abolition of the Excess Profits Tax
- Reduction of the capital gains period from the present six months and the amount of tax on capital gains
- Reduction or abolition of double tax on dividends
- Increase of the capital loss offset.



MARVIN CHANDLER

Vice President,
Reis & Chandler, Inc

What the Analyst Wants to Know

Aside from the so-called special situation analysis, such as a merger or recapitalization, and short run analysis, all the facts for which we as analysts search are needed to solve just two major problems—the quantity of future earnings and the quality of future earnings. Another factor to be considered is price—that is the extent to which quantity and quality of earnings are already reflected in the price of the security.

There are five major areas in which we need your help to reach a final conclusion as to earnings. These are:

- The effect of growth
- The measurement of recession resistancy
- Regulation
- The significance of operating factors
- The measurement of ability of management.

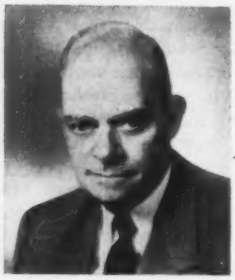
In my judgment the only growth that is significant to the investor is growth in per share earnings, resulting from an increased volume of business.

Among many questions to which we would like answers in the matter of recession resistancy are (1) How stable are revenues?; (2) How much of a mortality rate can be expected among commercial customers?; and (3) How fixed are expenses compared to other companies?

As for regulation, we are interested to know whether you intend to seek relief promptly when earnings drop below a reasonable level. I think that many of us are prone to judge the matter solely from the investors' viewpoint. You can help us see other sides to the problem which condition your thinking.

On the point of the significance of operating factors, we need to know, among other things, whether your transmission and distribution network is under-built or over-built, whether the margin of safety is thin, etc.

On the fifth point, our analytical approach to the appraisal of managerial ability is usually extremely limited. But it seems that good management should be apparent in the esteem in which the company is held in its community by public and political leaders.



Load Building—At a Profit

J. R. HARTMAN

Vice President,
Cincinnati Gas & Electric Co

As we expand our systems and replace units of generation or distribution with new ones at a higher cost, the system investment per unit of capacity will rise. It is our responsibility to analyze the situation to determine what steps can be taken to increase return on investment before resorting to further rate increases.

Increased sales of energy for such uses that do not adversely affect the system load factor appreciably will produce increased net earnings and an increased return on the investment. An aggressive sales program:

- Increases gross and net earnings
- Postpones or avoids necessity for rate increases
- Provides the growth factor which makes additional investment necessary
- Improves public relations.

During the period following start of World War II some sales budgets were cut. Others increased but not as fast as the growth of revenue so that there has been a general decline in sales expense per dollar of gross revenue. Every effort should be put forth to increase sales efficiency by a study of methods used in other industries.

Regardless of whether a company engages in merchandising appliances, major function of its sales effort is to create demand for an appliance. If the electrical industry is to approach its full potential in the next few years, manufacturers, distributors, and dealers must do more at the local level to increase public acceptance of appliances.

The trend toward higher investment and fixed costs and toward relatively lower variable costs in production of energy has caused load factor and its improvement to become one of the major responsibilities of a sales manager. He has the opportunity to influence load factor by a study of the daily and seasonal load curves of his company with respect to system and typical distribution feeder. Examination of these curves will indicate those periods in which load can be added without increasing distribution system peak or system peak or without increasing either.

By constant analysis of load conditions and reference to typical load curves of various appliances, he can shift emphasis from one appliance having a less favorable to one with a more favorable load characteristic.

Better Public Relations Through Salesmanship

CHARLES E. OAKES

President,
Pennsylvania Power & Light

Though we have been successful in solving the problem of production, we have not done as well with the one of beliefs. It is of primary importance in this area of ideas that the public be made more conscious of the nature of economic forces and the individual's importance in their creation.

We in the electric industry are peculiarly equipped to undertake at the local level this essential task of demonstration and improvement in public understanding. We have in our companies highly trained sales people engaged in meeting vast numbers of the public and in whom the public has confidence and respect. Unless we realize that "salesmanship can improve public relations," we are not realizing their full potential constructiveness.

Ways in which salesmanship can improve public relations are almost countless. Among them is helping schools, hospitals and similar institutions carry out the best possible modernization program within their limited budgets; furnishing leadership for local communities and regions in organizing for area development activities; and offering PTA's and similar organizations use of demonstration kitchens and other necessary materials for their programs.

These and many other activities can permit us to touch on the traditional concepts of society and no opportunity should be lost to do so and to stress the overreaching importance and high place of the individual in the scheme of things.

Behind them runs the theme that American business is not a deterrent to social progress nor is it in conflict with basic democratic principles.

And believing firmly that the responsibilities of business to the public call for a forthright position—a more aggressive defense of the rights of all citizens—we should not hesitate to be outspoken whenever, in our honest judgment, the occasion seems to demand it.

N. B. GUSSETT

President,
Iowa Power & Light Co

Long Range Planning Produced Iowa Plan

No business can long succeed these days without planning. It is not surprising that what be considered the first major step in the Iowa Plan came as the result of business planning and needs.

In 1947, Iowa was served, in the main, as it is now, by eight investor-owned electric utilities. Despite absence of heavy industrialization, loads were increasing and thinking, planning, and, in several instances, action began to be along lines of extensive construction which would be justified by lower reserve percentages, emergency availability, and economy interchange. Two of the largest companies banded together with two in Missouri to form the United Power Pool. An early result of the pooling was construction of a 465-mile, 161,000-v transmission line.

All companies included in their expansion studies the potential firm, secondary, and dump of federally owned hydro developments, existing and proposed, on the upper Missouri River. Actually, it seemed improbable that Iowa would receive any worthwhile amount as the Interior Department had limited the market area to a 150-mile radius from dam sites. Later the then Secretary of Interior announced that this would be increased to 250 miles.

To those of us who were familiar with local plans and budgets, and load growth prospects, the indicated Bureau lines were not only duplicative but in many respects inconceivable from standpoints of engineering or economics. The utility managers of Iowa met to discuss the matter and decided that data available to us were open to question.

On March 6, 1951 Congressional committees were advised that we had no power shortage and did not propose to have one, and that we stood ready to deliver any hydro power to customers over facilities that would not cost taxpayers one cent. As a result, the Bureau was refused all requested funds to build lines in Iowa.

In January, 1952, the true Iowa Plan began to take shape, when we embarked upon a statewide study with objectives of firm and dependable large capacity interconnections and of the development of an Iowa grid. The United Pool line formed the foundation of this new structure. A study was initiated which looked to a public and employee information program for Iowa utilities, and by June, 1953, great progress has been made toward accomplishment of our goals.

The entire grid will be completed in the not too distant future and it will be enlarged. The grid, tied in with transmission layouts of other utilities, offers promise of a worthwhile steam-hydro integration which could lead to much better utilization of tax dollars already spent on Missouri River hydro projects.

Working for 'Finer Carolina'

LOUIS V. SUTTON

President,
Carolina Power & Light Co

I have no reservations about the logic of a community development program in the activities of a power company. I think that such a program is becoming a growing responsibility which free enterprise must face more squarely if we are to avoid the inroads of bureaucrats who would convince the people that only a "welfare state" can offer a concerted action toward community betterment.

I can recommend such a program both for its tangible benefits to the service area and especially for its intangible returns in good will and improved public relations. Our "Helping to Build a Finer Carolina" program is one effort to meet the company's responsibility.

The company announced its program in March, 1952 at dinner meetings held simultaneously in 69 towns. It was designed to stimulate community pride and improve the economy of the various towns and communities we serve.

One booklet was prepared which described the various assets of the Carolinas and the progress they have enjoyed. It also called attention to areas which offered the best opportunities for further development. In another piece of literature, we outlined the step by step procedure needed by each community to assume its share of the responsibility. In addition, an outline was given of the extent to which the company planned to support the program through various advertising media.

Total cost of the promotion was about $100,000, but more than half this amount would have been spent through normal promotions. True enough, few of the projects

undertaken resulted in direct benefit to the company. We realized from the beginning that building a Finer Carolina was a long-range undertaking. We let it be understood that we did not consider it a philanthropy—we expected in time to retrieve its cost and profit by the investment.

Aside from tangible gains, I wish to call attention to its value in developing good public relations. Approximately 10,000 in. of publicity appeared in newspapers on our system; additional 6,000 in. resulted from releases contributed by our Publicity Department and more than 3,000 in. of editorial comment resulted.

Naturally, we made some mistakes during the first year. Maybe we will make new mistakes, but I am sure the good to be accomplished under the program will offset minor inequities which may result from errors of judgment.

ASHTON B. COLLINS

Reddy Kilowatt Service

PR and Advertising Have Role to Play

It was in the past 20 years that advertising and public relations in the electric industry began to grow up. Prior to that, public relations was not widely practiced by power companies; and advertising was almost in the same category. No longer are they being left to emergency or day to day methods.

Some new and significant trends have been taking place in these activities of our industry in the last few years. One of the most far-reaching has been the long range promotion of individual companies of community and regional programs for the betterment of the area they serve.

There is a strong feeling on the part of some executives that area programs are the most significant public relations development in the industry since World War II. Those programs, plus industrial development, Business-Education-Industry Days, coordinated dealers sales programs, state and regional promotion, etc., are building up across the country.

The industry is spending, on the average, only 6/10 of 1% of gross revenues on advertising promotion. Some companies are already doubling this. Commercial concerns frequently spend up to 5% or 6% of gross sales.

And now that electricity has become a family affair we must broaden our whole program along a wider front to encompass the whole family. It's a great challenge to all of us.

C. N. PHILLIPS

Director of Research, Ebasco Services, Inc

Steam Electric Power Mainstay of Future

Steam electric power must be the main reliance for the future if the electric industry is to meet the prospective requirements for fulfilling its primary responsibility to furnish at all times an abundant supply of electricity at the lowest possible cost consistent with good service.

Fast-moving inflation has made more difficult the successful discharge of this responsibility. So far good management, technological improvements, pooled operations of interconnected systems, and business volume have enabled electric companies to be the one major industry that has made no material increases in the price of its product. Continuation of this success will require every possible further improvement in efficiency and economy.

The generation of every kwhr of potential hydro power would supply only a small portion of the 1975 requirement. Steam electric power and energy must be the main reliance of the future. Increase in size and efficiency of steam units has been and will continue to be of great aid in keeping down the cost of electricity.

The following are conclusions drawn from an energy transmission study we have made, which hypothetically covers distances up to 700 miles, blocks of power up to 3,600,000 kw, and transmission voltages up to 460 kv.

- Economic advantages of large generating units in stations of great capacity are so important that their use is indicated when load concentrations allow.
- Main reliance to meet future load growth will be in steam stations using coal and lignite to a limited extent, as their primary fuel.
- Long-distance transmission cannot be justified economically unless generating station is located, in effect, at a mine mouth with an assured long-term, low-cost, raw fuel supply.
- Unit costs of transmitting energy are lowered where large blocks of power are to be moved. Combined with high load factor loadings, this tends to bring transmission and transportation of raw fuel into closer competition.
- Where long-distance transmission is indicated, rail competition and financing costs of lines determine the balancing economics.
- Use of types of financing similar to those by groups of companies to construct larger plants and lines to serve atomic plants would extend limits of economic transmission distances.

Expand Leadership Programs

GROVER C. NEFF

President,
Wisconsin Power & Light Co

The question of leadership in our business is vital to the continued success of our industry, and it is important that each chief executive take another look at his own organization to see if he can profitably implement and expand the things now being done to provide future leaders for his company.

With our industry due to grow four times as fast in the next eight years as it did in the past 32, we need the very best men and women to take over leadership of this industry when vacancies occur. It is probably the most important single development which confronts us today.

To do this, we will probably have to re-examine the departments in our companies concerned with personnel, employee, and public relations problems. Top management must cooperate with these departments so as to become personally acquainted with candidates. They should take an active interest in their development and let them know it. This will not only help management to make selections for leadership jobs but will also help enthuse candidates to do their best.

Candidates for top jobs must have good personality, good judgment, fair attitude, courage to defend against unwarranted attacks, good character, ability to get things done, knowledge of this business, and humility.

Such people—none of whom need be perfect in all these respects—must be found on our own payrolls, in college graduating classes, or in other callings. Best source is college students who should be convinced that:

- The utility business is a good business to be in.
- The company has a definite training and development program.
- Starting salary is in line with what others pay for comparable work.
- You are particular about whom you hire but that once you hire somebody, you don't put him on the shelf and forget him.

Each leadership hopeful should have his record frequently reviewed and should be told how he is doing. He should be praised for doing well and given helpful criticism on the things he has not done well. This is important because we, as present leaders of the electric companies, must be certain to get the right kind of people properly trained to take over the leadership of our rapidly growing companies.

Management Men Need Character

DR. HORACE HILDRETH

President,
Bucknell University

In America for 20 years, either directly or indirectly, private industry has been castigated and government exalted—largely for political purposes. Now we have a reversal in political thinking and private industry has responsibility that it cannot avoid. With withdrawal of the power and leadership of England in world politics, the United States, unwilling and unprepared, must assume the problems of free world leadership.

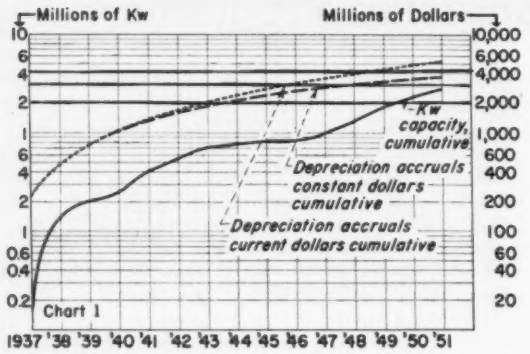
Your own President England on the problem of the quality of leadership needed in private industry says that a new type of leader is needed for the future. As the scope of his operations broadens, as the welter of technical and specialized considerations and problems becomes more numerous and complex, the management man must never forget his relationship to the people of his organization, his community, his nation, and its way of life.

This broader responsibility requires unusual qualities of leadership. The most important consideration in selection of a top management man is character. He will demonstrate conscientious determination and capability in carrying out company, community, or national responsibilities. It will be instinctive in him to choose the honorable course; he will have a full and human comprehension of the significance of each part of his organization's operation.

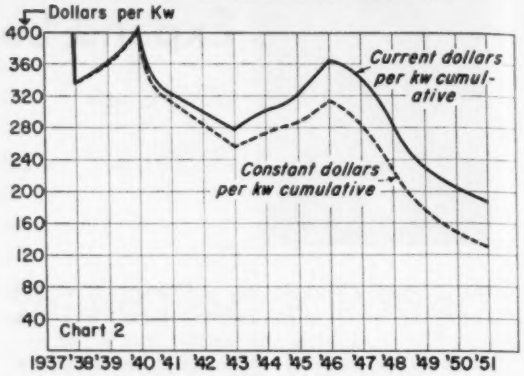
As an educator, let me urge leaders of the electric industry to use their leadership in the field of education. There is great necessity for those of us who want to know what our youth is learning to take a more active interest in and to give more active support to our schools and our educational system.

In the new economic and political clime in which it has so recently found itself, I hope and believe that the leadership of the electric industry will live up to both its responsibilities and opportunities so effectively and efficiently that it will become the brightest star in the firmament of private enterprise.

Depreciation Accruals and Capacity Added—Kw
Investor Owned Electric Utilities in the U.S.—1937 to 1951



Depreciation Accruals per Kw of Capacity Added
Investor Owned Electric Utilities in the U.S.—1937 to 1951



Higher Rates of Return Are Needed

To maintain integrity of utility plant the author makes a case for a higher rate of return on an original cost rate base.

C. P. GUERCKEN, Assistant to Vice President, Ebasco Services, Inc.

The electric utility industry has been unable to make adequate provision to maintain the integrity of its property in depreciated dollars because of the inadequacy of rates allowed by most regulatory bodies.

Fundamentally, not only is there an economic deficiency (for rate making purposes) in the depreciation reserve accruals, but the current additions to earned surplus should be considerably higher to take care of the risks and contingencies inherent in an inflationary economy.

This problem is amply illustrated by studies which show that the reproduction cost of new electric utility property (based on a three year average price level) amounted to $31.9 billion on Jan. 1, 1952, compared with the gross plant at original cost of $20.7 billion.

Further studies show that in order to maintain the integrity of the property in terms of the above price levels it would be necessary to accrue $730 million annually, as of Jan. 1, 1952. This can be compared with actual depreciation charges of $473 million made by the Class A & B utilities on their electric plant in 1951, or a deficiency of $257 million.

Similarly, in order to bring current accruals to surplus in line with the above increase in property cost, the 1951 addition to earned surplus of $163 million should be raised to $252 million, or a rise of $89 million.

Need for Increased Earnings . . . One of the ways that the above deficiencies can be made good is by increased earnings flowing through to earned surplus. Both are elements of increasing risk which should receive due compensation in the rate making process of regulation. Consequently recognition of both of these factors would require earnings being raised to a total of $346 million, or an equivalent of $720 million before Federal income taxes.

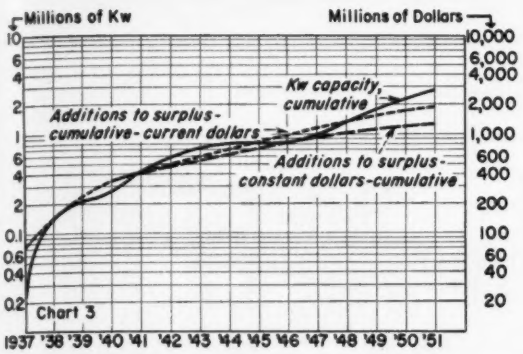
In terms of 1951 electric operating revenues the foregoing adjustments would require a 13.8%, across the board, increase. In view of the inroads of inflation, the industry's pricing policies, and the physical scope of its operations such an increase is modest enough and not unduly burdensome on the industry's customers considering the value of service received.

While the foregoing deficiencies measure both the element of risk and the need to maintain integrity of property, other and equally important measurements deal with the adequacy of these factors in relationship to the physical size of the industry.

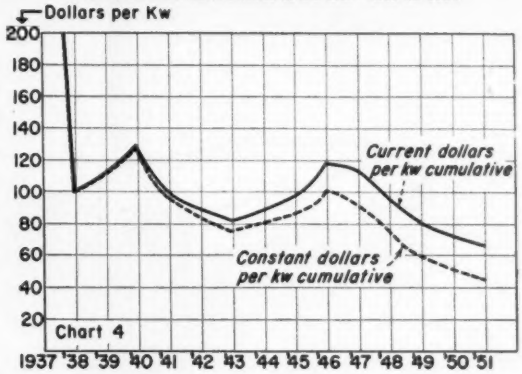
Reserve and Surplus Accruals . . . One of the measures of adequacy of surplus and reserve accruals is the relationship which they bear to capacity additions. Because of the unsatisfactory nature of the records kept prior to 1937, the starting date of this analysis begins with that year.

One of the principal reasons for using gross annual credits to both earned surplus and depreciation reserves is that by this method the difficulty of subsequent book adjustment (such as write-offs, debits for retirement of property) is eliminated. The practical effect of this assumption is as if the industry made its start in 1937 both financially and physically since kw capacity additions are also calculated beginning with 1937. Four separate computations were made as shown on the accompanying charts.

Net Additions to Surplus and Capacity Added—Kw
Investor Owned Electric Utilities in the U.S.—1937 to 1951


Millions of Kw
Millions of Dollars
Kw capacity, cumulative
Additions to surplus-cumulative-current dollars
Additions to surplus-constant dollars-cumulative
Chart 3
1937 '38 '39 '40 '41 '42 '43 '44 '45 '46 '47 '48 '49 '50 '51

Net Additions to Surplus per Kw of Capacity Added
Investor Owned Electric Utilities in the U.S.—1937 to 1951


Dollars per Kw
Current dollars per kw cumulative
Constant dollars per kw cumulative
Chart 4
1937 '38 '39 '40 '41 '42 '43 '44 '45 '46 '47 '48 '49 '50 '51

to Provide For Economic Depreciation

Deficiency in Depreciation Reserve Accruals . . . As regards the relationship of depreciation reserve accruals and kw capacity installed, it will be seen from Chart 1 that there has been a substantial deterioration in the relationship of reserves to plant capacity installed. If the post-war correlation of the two trends is to be restored to normal, the accruals to the depreciation reserve (in terms of 1937 dollars) should be more than twice the present amount. It will be seen from the chart that the current reserve balance of $3.8 billion would have to be increased to $7.2 billion, or a rise of 90%. Similarly, the annual reserve accrual for 1951, of $228 million, would have to be raised to $432 million. On a current dollar basis this amounts to an annual accrual of $996 million, or $523 more than the present rate. It will be noted that the annual reserve accrual of nearly $1 billion dollars is substantially higher than the accrual of $730 million indicated earlier under the plant deficiency theory.

Again the foregoing should not be construed as an argument for increasing depreciation accruals on the books of the industry. The purpose of this analysis, based as it is on rate making principles and not accounting conventions, is to indicate that reserve accrual deficiencies should be considered as an additional factor of risk to be compensated by a higher and more realistic return to the investors.

Finally, if the above deficiency of $523 million per annum is to be made good through additional accretions to surplus the 1951 amount of $163 million would have to be raised to $686 million in order to preserve the integrity of utility property.

As regards the relationship of depreciation accruals to kilowatts on a unit basis, it will be seen from Chart 2 that the position (apart from two upswings) has steadily deteriorated. In terms of constant 1937 dollars it will be seen that the depreciation accruals per kw of capacity fell from $337 in 1938 to $134 in 1951, or a decline of 60%.

Relationship of Surplus Accruals to Kw Added . . . The significant feature of Chart 3 is the loss of relationship between earned surplus and capacity beginning with 1946 and ending with 1951, or the period of postwar expansion. This is true both for current and constant 1937 dollars but especially for the latter since this is the true measure of solvency and adequacy of the financial cushion.

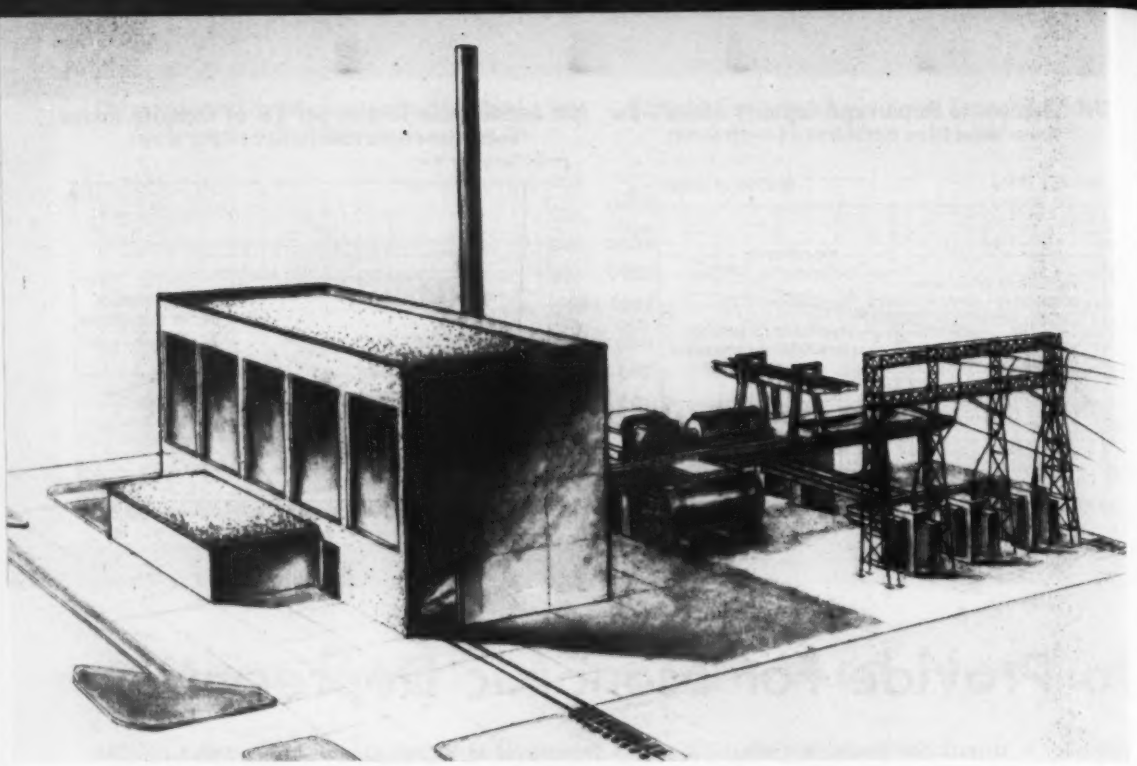
In order to restore the normal relationship of surplus and capacity without, however, disturbing the cyclical variations of the two functions, the ending 1951 balance should be at $2.2 billion instead of the $1.292 billion shown on the chart. This is an increase of 70% and, consequently, the 1951 gross credit to earned surplus of $70,490,000 (in constant 1937 dollars) should be raised to $120 million. Translating this into current dollars, adequate surplus accretions for 1951 would have to be raised from $163 million to $278 million.

The foregoing data was also computed on a unit basis of dollars of surplus accretions per kw as shown on Chart 4. It will be seen that a progressive deterioration has taken place in the relationship of annual surplus accretions with respect to the physical size of the industry. While the 1937 figure of $448 was abnormally high, the decline, when measured against a more normal year such as 1938, is highly significant. Even in terms of current dollars the decline was marked and amounted to 67% of the 1938 level. In terms of constant 1937 dollars it will be seen that the industry had lost heavily in its ability to set aside adequate amounts in surplus since its gross credit per kw amounted to only $45.70 as compared to $100.10 in 1938 and $101.00 in 1946.

The foregoing decline from the 1938 figure amounts to 54.5% as compared to a decline of 60% for the depreciation-kw relationship.

Although there are other tests of adequacy, only one other will be mentioned here; namely, the relative position

(*Continued on page* 258)



ATOMIC POWER PLANT may look like this. Tall stack will serve as vent for disposition of radioactive dust or gas to the atmosphere should an emergency condition arise. Design provides for installation of a 150,000 kw low pressure turbine, out of doors

PG&E-Bechtel Team Reports . . .

Liquid-Metal-Cooled Power Reactor Looks Promising

Study of two types of reactors justifies proceeding with design and construction stage of sodium-cooled reactor. Aggressive development of liquid-fuel breeder reactor should continue, joint report recommends

Prospect of reasonable-cost electric power from atomic reactors is brightened by results of detailed cost and engineering studies of two representative reactors. Studies made jointly by Pacific Gas & Electric Co and Bechtel Corp of a water-cooled thermal converter reactor and a liquid-metal-cooled fast breeder reactor produced these conclusions:

1. Design and construction of reactors to produce fissionable materials and electric power is technically feasible.

2. Costs of construction and operation of water-cooled thermal reactors may be predicted with fair accuracy, and detailed design could be started promptly. This type of reactor would be very attractive if primary emphasis is placed on plutonium production at the earliest possible date and for a definite production period.

3. The liquid-metal-cooled fast reactor is more attractive as a power producer because it conserves existing supply of uranium and appears adaptable to present-day steam conditions. Present engineering background justifies proceeding with design and construction even though certain development work will be required during design period.

4. Sale of power from dual-purpose reactors will not substantially reduce cost of plutonium production but will more than justify cost of power-generating equipment in dual-purpose installation. At current plutonium demand and cost, dual-purpose reactors may be built economically and will have continuing value for power production when demand for plutonium drops.

Consideration was given in the study to a fast reactor of liquid-fuel type. While it appears to offer greatest

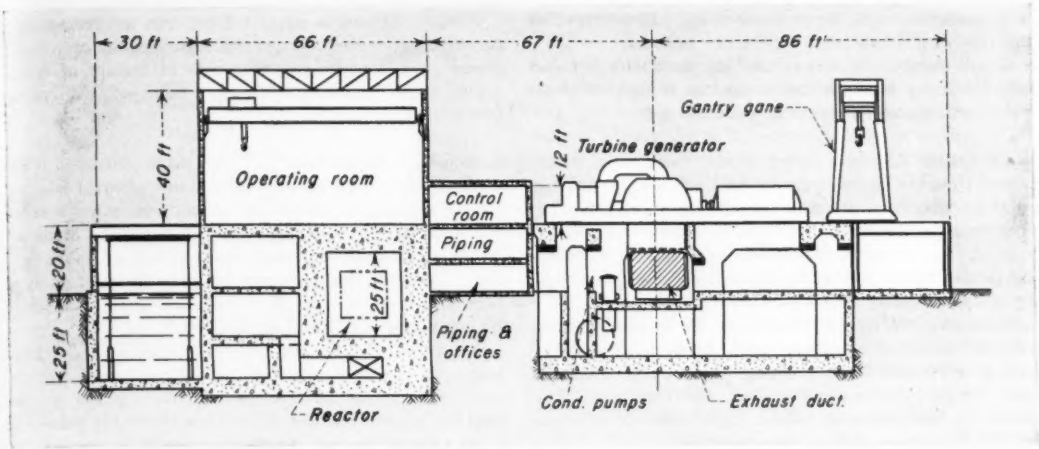


FIG 1—WATER-COOLED REACTOR PLANT may be designed and built relatively quickly, but can only produce steam of low pressure. It is expected this type of reactor will be superseded. Total estimated cost of such a plant is $41,000,000

possibilities for low-cost power production, additional development necessary prevents design and construction in the near future. Also, present stage of development precludes possibility of cost study.

In its report to the Atomic Energy Commission, the PG&E-Bechtel group recommends that development and design of a liquid-metal-cooled fast breeder with solid fuel elements be started promptly, that construction be started when design is completed unless design is rendered obsolete by new developments, and that, concurrently with this design, AEC should continue aggressive development of the liquid-fuel breeder reactor.

Up to 150-Mw Output . . . As a basis for the detailed study, reactor size of 500 Mw was selected as reasonable, with a corresponding net output of 100 to 150 Mw. This is roughly the maximum feasible size of a low-pressure turbine. Installation would produce significant amounts of power and plutonium but would be a compromise between a smaller pilot plant and a larger, more economical plant.

Of the two types of reactors chosen, the light-water-cooled, heavy-water-moderated reactor is the quicker to design and build and its cost can be predicted with some confidence. However, it is limited to low steam pressures

Table I—Design and Operating Data for Dual-Purpose Reactors

	Water-cooled thermal reactor	Sodium-cooled factor reactor
Power		
Total heat, Mw equivalent	500	500
Gross electric power, Mw	106.2	154.6
Net electric power, Mw	100.6	145.3
Capacity factor	0.75	0.80
Materials		
Fuel	Natural uranium	U^{235}
Fertile material		U^{238}
Diameter of core	13.2 ft	38 in.
Height of core	11 ft	38 in.
Moderator	Heavy water	
Reflector	Light water	Lead
Shield	Concrete	Concrete
Primary coolant	Light water	Sodium
Primary Coolant		
In temperature, F	384	600
Out temperature, F	500	900
Pressure, psig	1000	
Moderator		
In temperature, F	120	
Out temperature, F	180	
Secondary coolant		
In temperature, F		550
Out temperature, F		850
Steam conditions		
Pressure, psig	165	485
Temperature, F	375	750

Table II—Estimated Capital Costs for Dual-Purpose Reactors

	Water-cooled thermal reactor (Thousands of Dollars)	Sodium-cooled fast reactor
Site and improvements	2,800	2,800
Reactor		
Structure	3,250	4,000
Core		
Tank	250	500
Piping	3,550	2,600
Thermal shield and accessories	350	900
Blanket		2,000
Heavy water	7,000	
Sodium		800
Cooling circuit		
Piping, pumps and equipment	3,550	7,500
Steam generators	2,800	3,500
Auxiliary circuits		
Pure water	800	800
Heavy water	750	
Sodium		3,000
Helium		500
Controls	850	1,500
Fuel handling	1,200	6,000
Total reactor	24,350	33,100
Turbo-generator plant*	12,650	13,600
Step-up facilities	1,200	1,500
Total estimated capital cost	41,000	51,000

* Water-cooled reactor, 106.2 Mw; sodium-cooled reactor, 154.6 Mw.

with associated low thermal efficiency. It is expected this type of power reactor will be superseded.

Liquid-metal-cooled fast reactor has the ability to breed new fissionable material and to operate at high temperatures both desirable features in nuclear power.

Water-Cooled Reactor . . . Preliminary design of a water-cooled natural-uranium reactor was sufficiently detailed so as to describe a practical reactor and turbo-generator combination. This combined design would establish a basis for cost estimates, for organizing a detailed engineering design, and for pointing out what detailed development was necessary before a plant could be built.

Essentially the reactor consists of an aluminum tank with a number of aluminum tubes between tube sheets serving to contain the moderating heavy water. Pressure tubes for the fuel extend through the core tank concentric to the aluminum tubes. Light water as primary coolant flows through these pressure tubes.

Cooling water enters pressure tubes from an inner-ring header, flows through center portion of the core, through crossover pipes on top of the reactor, and down through outside pressure tubes into an outer-ring header. Velocity of about 15 ft per sec provides adequate heat-transfer rates.

Cools Most Active Tubes . . . This two-pass arrangement, while subject to further study, provides coolest water to most active tubes and increases allowable spacing between fuel elements. Because both inlet and outlet headers are below the reactor-core tank in this arrangement, problems of loading and unloading are less complicated.

The reflector consists of a 1-ft thickness of demineralized light water surrounding the core tank and 1 ft of heavy water across its top and bottom. Light water is contained in several segmental tanks with space between tanks occupied by control plates. This water is circulated through heat exchangers within the secondary shield.

Table III—Estimated Annual Operating Costs for Dual-purpose Reactors

	Water-cooled thermal reactor	Sodium-cooled fast reactor
	(Thousands of Dollars)	
Reactor plant		
Operations and supplies*	585	585
Heavy-water make-up ($7,000,000 at 5%)	350	
Maintenance (1% of capital excluding heavy water)	170	330
General expense (15% of operation and maintenance)	115	140
Total reactor plant	**1,220**	**1,055**
Power plant		
Operation ($1.70 per kw-year)	180	265
Maintenance (1% of capital)	130	140
General expense (15% of operation and maintenance)	50	60
Total power plant	**360**	**465**
Total operating cost	**1,580**	**1,520**

* Includes these personnel: operating crew, 46; health physics, 16; technical services, 13; security, 22; and administration, 6.

Primary coolant is circulated between the reactor and steam generators by conventional high-capacity centrifugal pumps with injection glands to prevent leakage of radioactive water. Valves are similarly equipped with injection glands.

Sectionalized Steam Unit . . . The steam generator is divided into four sections, each located in a separate shielded cubicle adjacent to the reactor. Each section has a separate drum for disengaging entrained moisture. Made of carbon steel, drum and shell side of heat-exchange section is designed for an operating pressure of 250 psig. Tube side is of stainless steel and is designed for operating conditions of 1,100 psig and 600 F.

Steam at 165 psig and 375 F is utilized in tandem-compound, double-flow, 1,800-rpm turbine having a maximum capability of 125,000 kw. Auxiliary power is supplied by 2,300-v bus energized from either the generator or an external source. Emergency power is supplied by a 125-v battery supplemented by an engine-driven generator.

All important instruments, emergency reactor-cooling pump, and emergency lighting automatically switch over to emergency power supply. Auxiliaries for primary coolant system include pressurizer, degasifier, emergency cooling pump, gland injection pump, off-gas pump, dump tank, and make-up pump.

Moderator-cooling system of aluminum pipe is designed to handle 7.5% of total heat output from the reactor and to cool the heavy water from 180 to 120 F. Pumps in this system must have essentially zero leakage because of high value of heavy water. Other equipment in moderator circuit include gas-recombiner-and-recovery unit, treatment facilities for maintaining necessary purity of heavy water, degasifier, and surge tank.

Primary and Secondary Shields . . . Thermal shield is comprised of a ventilated 6-in. thickness of iron and material containing boron surrounding the reflector. Primary shield surrounding the reactor includes 8-ft thickness of ordinary concrete having a minimum of penetrations.

Secondary shielding surrounding steam generators, pressurizer, moderator coolers, and other auxiliaries is 3-ft thickness of ordinary concrete. It is arranged so that any of four steam generators may be serviced or repaired without shutting down the reactor. Other auxiliaries are in a single and separate compartment.

Reactor control is effected by plates located at intervals around the core tank periphery. Plates occupy aluminum sheaths between tubes in the "in" or "piledown" position. They are withdrawn from the sheaths by a servomotor actuated from the control system. In an emergency shutdown plates are released from drive motor electromechanically and fall into place within the sheaths.

The reactor is housed as shown in Fig 1 along with steam generators and service facilities. Control room for reactor and turbine systems and storage area for new fuel assemblies are in same building. Irradiated assemblies are held in a separate storage tank served by a monorail system. Building also contains space for control laboratories and maintenance shops and for personnel facilities and offices. Design and operating conditions for water-cooled and liquid-metal-cooled reactors are shown in Table I.

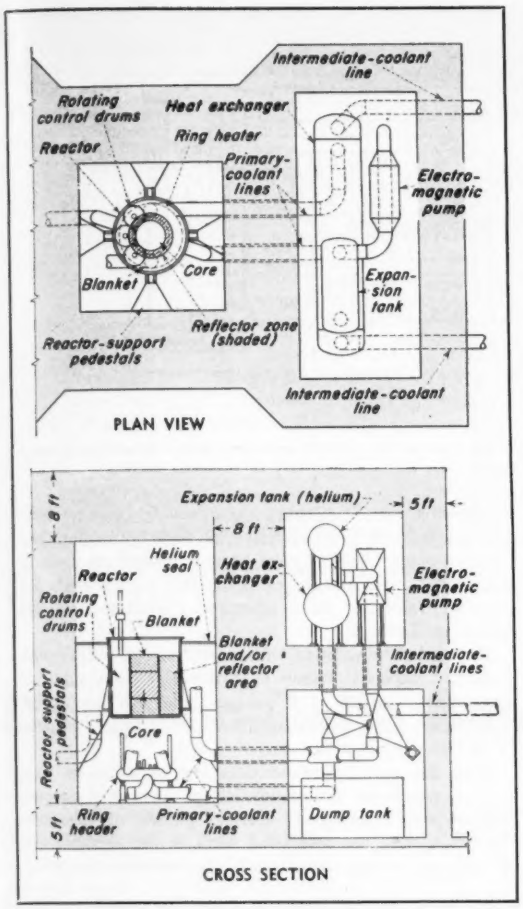


FIG 2—SODIUM-COOLED REACTOR holds more promise for future because present-day steam conditions appear capable of production. More development work is necessary, however

Liquid-Metal-Cooled Reactor . . . This fast type of reactor differs from the water-cooled thermal reactor in these respects:

1. There can be no materials of low atomic weight to moderate or slow down neutrons. Therefore, low-pressure, liquid-metal cooling is used.

2. Because materials have much less tendency to absorb neutrons at fast energy levels, choice of structural materials is broadened. Stainless steel appears suitable for this reactor.

3. Because of differences between certain nuclear constants for thermal and fast neutrons, exposure time is longer and fuel-handling costs correspondingly lower.

4. More fissionable material can be produced than is consumed.

Illustrated in Fig 2 is the dual-purpose fast reactor plant which served as a basis for design details and for the cost estimate. It is based on the Knolls Atomic Power Laboratory breeder. Reactor core of highly-enriched material is surrounded by a breeder blanket of either depleted or natural uranium. More than 90% of heat is produced in the core, which consists of a large number of stainless steel fuel elements.

A reflector to envelop the core would serve to decrease the critical mass and also to limit heating outside the core. Core, blanket, and reflector are contained in a steel cylinder about 8 ft in diameter and 8 ft high. Provisions for circulation of liquid coolant, for refueling, and for control mechanism must be made in cylinder.

Sodium is Coolant . . . Heat is removed from core and blanket by liquid sodium circulated at about 30 ft per sec by two electromagnetic pumps. Primary coolant is pumped to two intermediate heat exchangers, entering at 900 F and returning to the reactor at 600 F. Heat is transferred from the primary coolant to an intermediate coolant, also sodium, which is circulated by electromagnetic pumps to steam generators. Intermediate heat exchanger can be of normal single-tube construction because leakage of sodium from intermediate to primary circuit will not affect reactor operation.

Collant at 850 F produces superheated steam at 485 psig and 750 F in two 800,000 lb/hr steam generators. They each consist of a steam drum, evaporator, and superheater section. Single-tube construction is used in the generators because both sides are operated at full boiler pressure and any mixing of sodium and water will not endanger reactor operation.

Steam is delivered to a tandem-compound, 1,800-rpm turbo-generator of 154,600 kw maximum capability. Although of relatively low-pressure, this unit operates on a conventional regenerative cycle with four extractions for feed-water heating as diagrammed in Fig 3.

Two Means of Control . . . Reactor control can be effected either by moving a reflector between core and blanket or by altering disposition of fertile and fissionable material. Either action can be accomplished by the use of control drums.

Refueling a liquid-sodium-cooled reactor requires that an atmosphere of inert gas be maintained over the sodium surface. Thus, refueling mechanism must be positioned, reactor core and blanket exposed, spent and irradiated elements removed, and fresh elements placed in reactor without introducing air into coolant space.

Several features of refueling schedule for dual-purpose fast reactor are significant and must be emphasized:

1. Complete refueling of core and inner portion of breeder is required annually.

2. If reactor operates as converter, U^{235} remaining in core must be decontaminated and reprocessed.

3. If reactor operates as breeder, portion of separated and decontaminated plutonium must be reprocessed to make another core.

Prolonged Operation . . . The breeder reactor is designed for 80% annual capacity factor operation, with one month allowed for scheduled refueling and maintenance. Nuclear constants of various materials appear favorable for this type of prolonged operation and high burn-up. Fuel elements with U^{235} as fissionable material should present no particular difficulty in fabrication.

From both economic and operating standpoints, fuel elements should be fabricated in a separately operated facility having capacity for several similar reactors. By such an arrangement fuel-element costs can be reduced.

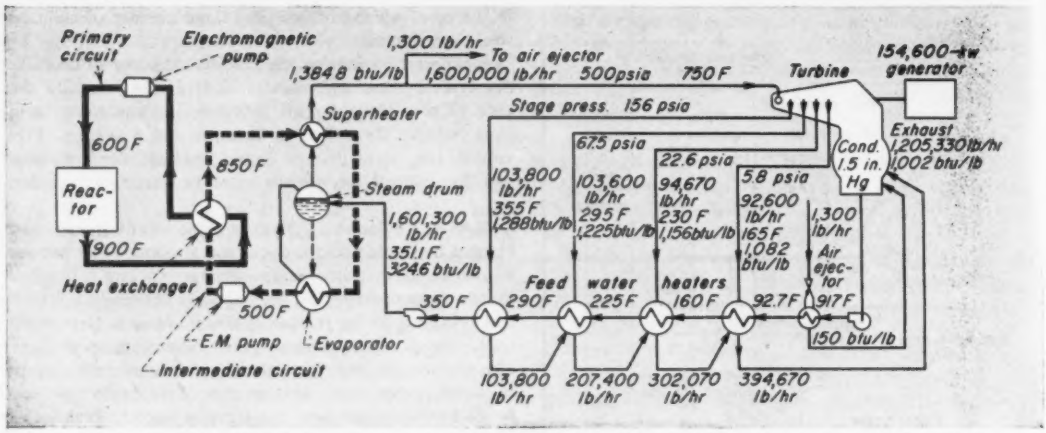


FIG 3—NO LOSSES and 500 Mw equivalent of heat are assumed in heat balance for sodium-cooled fast reactor. Net station heat rate is 11,760 Btu/kwhr for 145,300 kw of net power. Conventional regenerative cycle has four extractions for feedwater heating

In general, the liquid-metal-cooled fast reactor is not equal to water-cooled thermal reactor on basis of existing technology, required design and construction time, reliability of cost and performance estimates, or safeguards and degree of isolation now required. However, outstanding advantage of liquid-metal-cooled reactor, as contrasted with water-cooled type, is possibility of improved steam conditions. Present fast reactor design is coupled to throttle steam pressure of 485 psig and a temperature of 750 F. However, tests to date show no limitation on temperature of liquid sodium. With further development and operating experience, coolant temperatures to produce 1,000 F steam appear feasible.

Table IV—Economics of Power Production Only by Sodium-cooled Fast Reactor

	Dual-purpose Reactor*	Dual-purpose Reactor for power only** Case A	Case B	Case C	Conventional Steam Plant
Reactor and power-plant capital					
Site and yard improvement	2.8	2.8	2.8	1.1	0.5
Reactor plant	33.1	33.1	33.1	16.6	
Power plant	15.1	15.1	15.1	12.1	13.5
Total, millions	$51.0	$51.0	$51.0	$29.8	$14.0
Annual capital costs					
Site and yard improvement	0.36	0.36		0.15	
Reactor plant	4.50	4.50		2.26	
Power plant	2.05	2.05		1.65	1.90
Total, millions	$6.91	$6.91 (6.8)***		$4.06 (3.6)	$1.90 (2.9)
Annual operating and maintenance costs					
Reactor	1.06	0.74	0.74	0.37	
Power plant	0.46	0.46	0.46	0.35	0.40
Total, millions	$1.52	$1.20 (1.2)	$1.20 (1.2)	$0.72 (0.6)	$0.40 (0.6)
Annual fuel costs					
Fuel and chemical processing, millions	$10.38	$4.60 (4.5)	$2.50 (2.4)	$1.50 (1.3)	$1.67 (2.5)
Cost of power					
Total annual costs, millions	$18.81	$13.71	$3.70	$6.28	$4.00
Net capacity, Mw	145	145	145	160	100
Net output, million kwhr	1020	1020 (12.5)	1020 (3.6)	1120 (5.5)	667 (6.0)

* Operation as currently conceived for power and plutonium production.
** Case A — Operation as currently conceived for power only.
Case B — Same as Case A but after five-year amortization.
Case C — Future improved reactor built for power only.
*** Cost in mills per kwhr.

Estimated Costs . . . Capital and operating costs for both dual-purpose reactors, exclusive of fuel fabrication and chemical-plant facilities, have been estimated on basis of June, 1952, rates and prices. Estimated capital costs are given in Table II, while estimated operating costs are shown in Table III.

The dual-purpose plant will operate at full output with maximum capacity factor to produce a maximum of fissionable material. It is assumed that such power is dependable and is worth 6 mills/kwhr for the estimated 75 to 80% capacity factor.

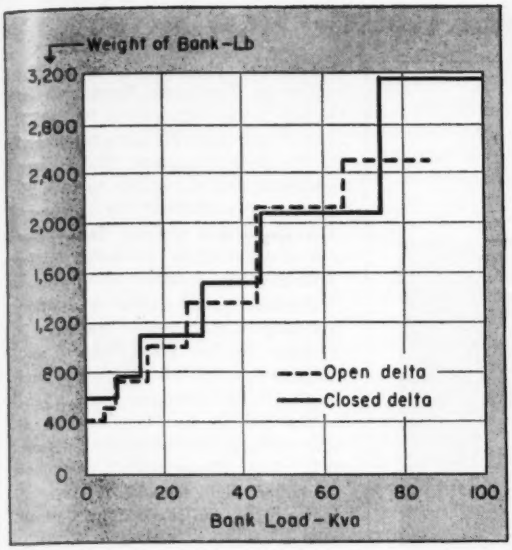
From foregoing economic data and assumptions total cost of producing plutonium in the two dual-purpose reactors was determined. Certain phases of uranium-plutonium cycle are associated with, or can be absorbed by, existing private industries or government operation.

Power Production Only . . . Three brief cost studies of the liquid-metal-cooled fast reactor were made to measure economic feasibility of nuclear power. Results are tabulated in Table IV for studies designated as cases A, B, and C. Additional data are given which represent operation of reactor for production of power and plutonium and operation of conventional steam power plant.

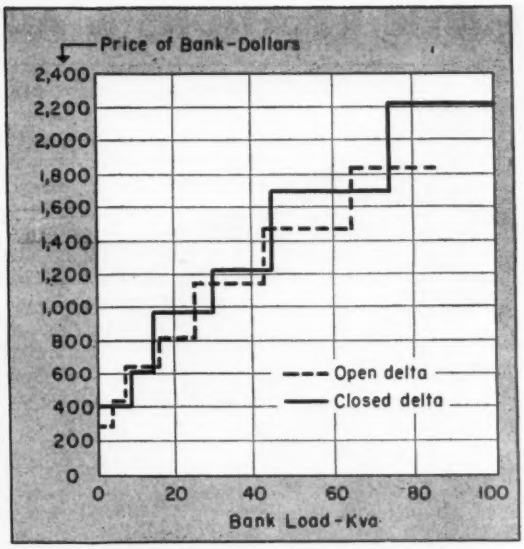
Several general assumptions were made including 20-year amortization (13.6% fixed charges) for atomic-power plants and fuel-fabrication plants; core-fuel exposure unchanged but blanket-material exposure increased; and no inventory charge for fissionable material.

In Case A it is assumed reactor operating costs are 70% of dual-purpose plant costs. Case B has same annual operating costs as Case A. Difference between operating costs and value of 6-mill power represents money available for fixed charges. Chemical-processing and fuel-fabrication facilities carry no fixed charges.

Case C represents an estimate of cost of power based on improved technology, operating experience, and construction of a large block of power, 500 Mw net, at one site. Adjustments made to conditions of Case A are as follows: Costs of site and yard improvements cut to 40%; reactor, to 50%; and power plant, to 80%. Operating costs of reactor are cut to 50% and of power plant to 75%. Power output is increased 10% and fuel-fabrication and chemical-processing costs reduced 66⅔%.



BANK WEIGHTS for open-delta and closed-delta connected transformers, with same load carrying capacity, are about the same



BANK COSTS for open-delta connected transformers are somewhat less than closed-delta transformers of equivalent carrying capacity

Do Open-Delta Banks Cost More?

JAMES E. MULLIGAN, Professor of Electrical Engineering, Worcester Polytechnic Institute, Worcester Mass.

Open-delta connected transformer banks are economical from a weight and cost standpoint. Although it is true that the kva rating of an open-delta bank is less than the sum of its individual transformers, the combination requires no more material than a closed-delta bank of similar output. Efficiency of material utilization is the same for both bank types.

These facts are widely misunderstood. A transformer text says that the principal disadvantage of open-delta connections is that they require a greater connected capacity than the symmetrical connection. Actually, this is not a disadvantage. Unused capacity, which weighs and costs nothing extra, is available for use if the bank is reconnected to closed delta in the future.

Factual Relations . . . Larger transformers are required for open-delta banks. When similar transformers are increased in size, iron and copper cross sections increase as the square of a linear dimension. With flux and current densities unchanged, the volt-ampere rating, which then depends on the product of their iron and copper areas interlinked, will be proportional to the fourth power of a linear dimension. Because the weight goes up as the cube of a dimension, it will increase as the three-fourths power of the rating.

In particular, an open-delta transformer rated $\sqrt{3}$ times that of a closed-delta transformer weighs only $(\sqrt{3})^{3/4}$ or 1.51 times that of closed-delta transformer. Thus, an open-delta bank weighs 2 x 1.51 or 3.02 compared to a weight of 3.00 for the symmetrical bank. Because there are some unit costs in manufacturing transformers, it might be expected that an open-delta bank would cost slightly less than a closed-delta bank.

Practical results of these considerations are shown in table and curves. The table compares weight and cost of both bank types. Figures in the first three columns were taken from a manufacturer's catalog. Ratings, weights, and prices for the banks were computed from these values.

Results of computations are plotted as the accompanying curves. They show the weight of the two banks to be nearly the same. For most loads the price of an open-delta bank is less than a closed-delta bank.

Weight and Cost of Transformer Banks

Individual Transformers			Open-Delta Banks			Closed-Delta Banks		
Rating kva R	Weight lb W	List price C	Rating kva 2R x 0.866	Weight lb 2W	List price 2C	Rating kva 3R	Weight lb 3W	List price 3C
3	205	$134	5.2	410	$268	9	615	$402
5	255	210	8.7	510	420	15	765	630
10	365	324	17.3	730	648	30	1,095	972
15	510	412	26.0	1,020	824	45	1,530	1,236
25	690	570	43.3	1,380	1,140	75	2,070	1,710
37.5	1,055	746	65.0	2,110	1,492	112.5	3,165	2,238
50	1,250	914	86.6	2,500	1,828			

Old woodcut made in 1859 shows the young aerialist Maria Spelterini tightrope across the great gorge below the Falls with baskets strapped to her feet. (She made it!)

YOU are in the next event at Niagara Falls

No matter where you live, you are involved in the next big event at Niagara Falls. It could be dangerous to your pocketbook, because it's going to cost somebody $300 million. Here, briefly, are the facts:

A big new hydroelectric power plant is going to be built on the Niagara River. Congress must decide who will build it—some agency of the government or the electric light and power companies now serving the area.

A group of five companies is ready to do the big job. They have asked Congress for the approval they need to start immediately. They have the plans, complete in every detail. They have the experience—fifty-eight years of power development at Niagara Falls. They have the lines to take the power where it will be needed. They can finance the project so there will be no need to burden taxpayers. Electric rates, of course, will continue low under normal public regulation.

But there are those who say the government should build the new plant—even if it takes longer, costs more, and moves America one step closer to the threat of socialized electricity.

HERE'S HOW THE CHOICE SHAPES UP—

If electric companies build the plant	If the federal government, for example, builds the plant
• The companies and their investors will pay for it.	• The cost will come out of taxes or be added to the national debt.
• Power produced will be shared by all, with rates regulated by state utility commissions.	• Specially favored groups will have first call on all power. Rates won't be regulated by the states.
• The project will pay about $23 million a year in additional local, state and federal taxes.	• Little, if any, taxes will be paid to local, state or federal governments from the sale of power.
• Defense plants and others will begin to get power in about three years.	• Government estimators have said it would take them at least five years.

NOTE: The Niagara River project will not affect the beauty of the Falls—on the U.S. side or the Canadian. Scenery or weather, ever.

WHO DO YOU THINK SHOULD BUILD THIS NEW PLANT? Talk it over with your friends and neighbors. Congress is discussing it now. The plan proposed by those who want government to do the job is a long step toward socialized electricity—because only power production is involved, with no other purposes, such as flood control, to complicate the issue. That's why these facts are brought to you by America's **ELECTRIC LIGHT AND POWER COMPANIES**.

Giving the Facts about Niagara Project

This advertisement by the Electric Companies Advertising Program will carry to voters in all parts of the country the facts about the redevelopment of Niagara Falls. It will be carried in most national publications on the regular ECAP schedule in June.

'Colorado Story' Is Popular

"The Colorado Story," a prize-winning exhibit prepared by Public Service Co of Colorado, is rivaling Pike's Peak as one of the state's big attractions. So far over 100,000 persons have seen it including citizens of 12 foreign countries.

Winner of Freedoms Foundation's highest award in its class, the exhibit has been touring Colorado since March 1952 and is now booked through the spring of 1954.

The exhibit was created by the company in an effort to inspire interest in the American way of life. It emphasizes what Colorado pioneers were able to do under a democratic government that allowed freedom for the individual.

Historical documents, original letters, artists' sketches, and pictures are arranged on 50 panels mounted on 27 sheets of masonite to explain the history of Colorado. The exhibit covers the time from the Folsom Man in prehistoric times until Colorado was admitted to the union in 1876.

Also on a panel in the exhibit is the bronze plaque awarded to the utility by Freedoms Foundation at Valley Forge, Pa., Feb. 22, 1952. The foundation's highest cash award in the general category, $1,500, was presented with the plaque to John E. Loiseau, president of the company. The foundation presents awards for outstanding efforts to preserve the American way of life.

Another panel carries a citation honoring Public Service Company. It is signed by Gov Dan Thornton and U. S. Senators Edwin C. Johnson and Eugene D. Millikin.

The exhibit has been shown at scores of schools throughout the state. It is usually displayed for 3 or 4 days at major high schools, 2 days at junior highs, and single days at grade schools.

Many teachers follow up the exhibit by asking students to write essays on what impressed them most.

The exhibit will be displayed this summer at Hospitality Center, an information headquarters in Denver's Civic Center operated by the city's Convention and Visitors Bureau.

'Better Living' TV Show to Start on ABC, June 21

As a part of its "Better Living" activity, the Electric Companies Public Information Program through the cooperation of the American Broadcasting Co will present during the summer the "Better Living Television Theater."

This will be a 13-week series on the ABC-TV network beginning on June 21. However, some individual stations have already presented some of the films. The network shows will be presented on Sundays, but the time will vary among the stations.

The series of films will tell how industries have contributed to better living. On ten of the shows prominent industrial leaders will appear as panel members. Peter Roberts, radio-TV commentator, will be the moderator for all the panel presentations.

The opening network show will be "Shining Heart," which shows how a public relations officer goes about making a film telling of company activities for employees. The following week the picture will be "Hidden World," a story of advancement opportunities in the engineering world.

WASHINGTON COMMENT

JESSE MOCK

Whether it chooses or not, the Eisenhower administration is forced to shape much of its federal power policy in full public view. In the long run this will likely work for the best. But in the day-to-day actions it does present some peculiar situations.

Republicans Seek a Power Policy Based on Laws

Interior on Both Sides of the Fence . . . Take Interior Department's conflicting stand on the role of the Federal Power Commission in hydroelectric development.

In its decision to pull out as a special pleader for the federal Hells Canyon project on the Snake River, Interior said it was leaving the matter up to FPC. "The granting of licenses for the construction of dams and hydroelectric plants on the rivers of the U. S. is the primary function and responsibility of the FPC and not of this Department," said Interior.

But in a brief filed within the same month, an Interior agency argued even more strenuously that "Congress did not vest in the Commission (FPC) paramount jurisdiction or full responsibility to protect the national interest in water power development."

This brief was filed in the Kings River case in which Interior is contesting an FPC license issued to Pacific Gas & Electric Co for a water power project in California.

Interior Must Explain the Contradictions . . . Certainly from these conflicting statements, it would appear that the new administration is on both sides of a key issue. You may be sure that Interior's opponents in the Kings River case will dwell to some extent on these compromising statements.

Likewise federal power advocates in the Hells Canyon case will use the Kings River brief to support their position.

In both cases Interior will have to devote a good bit of time to explaining the underlying reasons for its divergent arguments. As this reasoning is pretty complicated and legalistic, Interior will be hard put to get its story across to the public.

For the short run, then, the administration will have tough going. But it is counting on coming out on top for the longer pull.

Here Is What Is Happening . . . Interior and the administration are putting some of their administrative decisions to court tests. Decisions in the Hells Canyon and Kings River cases should spell out some of the finer points of Interior's legal responsibility in the field of water power development.

It is on this legal foundation that the Republicans hope to build not only their federal power policy but their policies in other fields. Armed with court decisions, they can decide whether new legislation is needed or whether the present laws are fair and workable.

Democrats Never Worried about the Law . . . This slow process of policy-making contrasts sharply with that of preceding administrations. The Democrats seemed content enough to work with a minimum of guidance from the law books. This is reflected by the small amount of legislation on the books pertaining to federal power marketing and the gaps in hydroelectric development policy.

With a clause here and a section there, the Democrats over some 20 years built up a federal power policy that favored public bodies in the power business and gave federal agencies broad authority.

The Republicans are now going back to the laws to find just exactly what they say and what justification there was for the interpretations that have been given them. It is from these same laws, shorn of their partisan interpretation, that the Republicans must make their policy.

Because this research is required, the solicitor at Interior is about the busiest man in the building. Because court actions can't be conducted in private, some of his research appears conflicting and compromising. It can appear no other way to those who have not made the extensive studies made by the solicitor.

The thing to remember is that the Republicans are working out a policy that they hope will be fair and politically attractive. It is important not to view every move as a reflection of their policy because they have worked out very little policy up to this time.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Uranium is so chemically active that it will burn under water and finely divided praticles will ignite spontaneously in the atmosphere at room temperature.

Highly aerated and rusty iron or steel acts similarly to copper in an electrolytic environment and creates a similar corrosion when coupled with lead sheaths.

Petroleum and natural gas result from bacterial action on ancient vegetation. Bacteria may, therefore, be resorted to for releasing petroleum still clinging to sand particles in oil fields now considered "worked out."

Corrosion engineers face this basic dilemma—if we ground we cannot protect from corrosion and if we protect from corrosion we cannot ground.

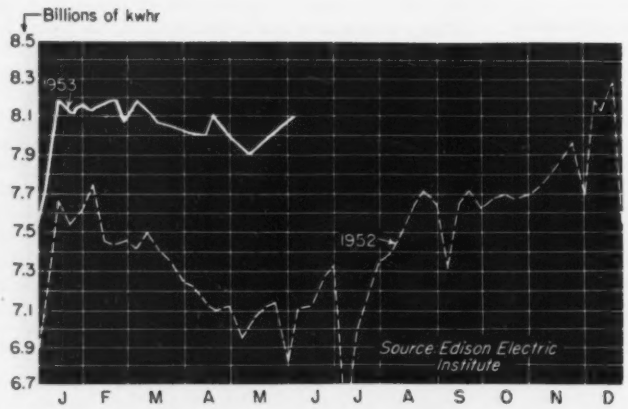
Freezing and thawing alternately are probably the greatest cause of deterioration of concrete surfaces; drainage or exclusion of water important.

What are present **relative kva volumes** for capacitors, induction regulators and step regulators for distribution system voltage correction?

Large power plants are more likely to be separated from their switching stations by lengthened distance. That makes for lightning exposure unless something is done to compensate.

Water cooling of overloaded and overheated cables in ducts may cost less per year than a single failure of the cable if not cooled.

STATISTICS



Output Week Ended June 6—8,096,330,000 Kwhr

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
June 6	+15.6	+12.4	+10.4	+19.3	+14.5	+19.5	+24.6	+10.2	+17.7	+4.4
May 30	+16.8	+17.1	+13.1	+15.9	+16.3	+21.8	+25.3	+8.9	+18.2	+6.1
May 23	+12.1	+12.3	+9.2	+9.9	+10.8	+19.4	+13.1	+11.5	+15.2	+7.9

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load (Million Kw)	Mar.	73.5	73.3	67.1
Capacity (Million Kw)	Apr.	83.84	83.17	76.74
Production (Billion Kwhr)	Apr.	35.63	36.97	31.51
Hydro		9.70	10.20	9.96
Fuel		25.92	26.77	21.55
Fuel Consumption				
Coal (Million Tons)	Apr.	8.91	9.44	8.05
Oil (Million Barrels)		7.15	8.08	4.20
Gas (Billion Cu Ft)		76.58	70.16	66.50
Sales (Billion Kwhr)	Mar.	31.73	31.21	29.03
Residential		9.10	9.31	8.32
Commercial		5.18	5.17	4.85
Industrial		15.36	14.76	13.98
Other		2.09	1.96	1.87
Net Income Class A & B Companies ($ Million)	Mar.	90.61	98.39	84.32
Estimated Dec. '53 Peak (Million Kw)	Feb.	86.5	87.0	89.1
Kwhr per Residential Customer (12 Month Average)	Feb.	2,195	2,183	2,037
Revenue per Kwhr Residential Service (12 Month Average)	Feb.	2.76¢	2.77¢	2.80¢
Canadian Production (Billion Kwhr)	Mar.	5.78	5.26	5.22

Business Statistics

FRB Industrial Production Index†††	May	242*	240*	211
Gross National Product Annual Rate ($ Billion)	4th Qtr.	355.2*	343.0	337.1
E. W. 5 Industry Production Index	Apr.	131.1	130.8	118.8
ENR Construction Cost Index††	Apr.	123.6	123.2	116.2
BLS Consumer's Price Index	Mar.	113.6	113.4	112.4
NEMA Insulation Materials Sales Index†	Mar.	694	649	536
NEMA Electric Appliance Sales Index†		356	306	278
NEMA Household Refrig. Sales Index†		211	208	163
Metal Prices (June 3)				
Copper, Conn. V., lb		$ .29¾	$ .29¾	$ .24½
Lead, N. Y., lb		.13¼	.12½	.15
Zinc, prime Western E. St. Louis, lb		.11	.11	.15
Tin, Straits, qual. N. Y. lb		.96	.96½	1.21½
Aluminum, ingot, base price		.20½	.20½	.19
Nickel, base price		.60	.60	.56½
Steel, billets, Pitts., ton		59.00	59.00	56.00
Steel, scrap, No. 1 heavy, Pitts., ton		45.00	45.00	45.00

*Preliminary **Revised †1936=100 ††1949=100 †††Unadjusted

Industrial Activity Boosts Weekly Output

Industrial production, now at an all time high, is reshaping the weekly output curve—raising it to correspondingly high levels.

For more than two months the net amount of energy distributed by the electric utility industry, as reported by the Edison Electric Institute, has shown weekly increases ranging from 11% to 17% over 1952.

Industrial production during May is placed, by a preliminary estimate of the seasonally unadjusted Federal Reserve Index, at 242, nearly 15% above 1952.

The April level of industrial production, with an FRB index of 240, was nearly 12% above 1952.

Revenue Up 8.8% . . . According to preliminary Federal Power Commission figures, electric operating revenues of the larger privately-owned electric utilities in the United States for the first quarter in 1953 were $1.5 billion compared to first quarter 1952 revenues of $1.4 billion, an increase of 8.8%.

Revenue deductions, including operating expenses, depreciation and taxes, were $1.2 billion, up 8.3% over the first quarter in 1952. First quarter 1953 gross income, including other utility operating income, amounted to $368.8 million representing an increase of 9.2% over the same period a year ago.

Net income of $287.5 million was up 10.7% over the $259.8 million reported in the first quarter of 1952.

March electric operating revenues amounted to $502.9 million, revenue deductions for the month were $406.4 million, gross income increased 7.0% to $117.5 million while net income of $90.6 million showed an increase of 7.5% over the $84.3 million reported for March 1952.

Use of Fuel Oil Gains . . . The consumption of fuel oil during April reached 7.2 million barrels, 70% above the 4.2 million consumed in April of 1952. March use was 54.8% above 1952.

During April the use of gas amounted to a record April use of 76.6 billion cubic feet, 15.2% over April of 1952 and 9.2% above the preceding month.

Proposed BPA-PGE Pact . . .

. . . may set pattern for federal power policy. Twenty-year agreement awaits approval of Northwest utility groups

New pattern for federal power policy may be set by acceptance of a proposed 20-year contract between Portland General Electric Co and Bonneville Power Administration. If the new agreement is approved by all utility groups in the Pacific Northwest, it is expected similar contracts will be worked out with seven other private companies* who were in on initial negotiations.

Drafts of the new agreement, on terms thrashed out in Washington, D. C., and in Portland by company representatives, have been submitted to public utility districts, rural electric cooperatives, and other preference customers for appraisal. Secretary of Interior Douglas McKay has pledged that a hearing will be given any protesting group or agency. Copies also have gone to BPA's direct industrial customers — electro-chemical and others—and the eight private companies.

Allocations Not Fixed . . . While the proposal clarifies many disputed points between the federal agency and the private company, it does not state how much energy BPA will be able to allocate to PGE if the contract is accepted. Public agencies and cooperatives have a priority on firm power supplies and load forecasts indicate slim fare for private companies in years ahead until major federal projects being built come on the line (See Table I). Even then, energy available for private companies will decline steadily from an estimated 3,637,920 kwhr in 1958-59 unless new projects are started or other sources of power become available in a few years (See Table II).

Proposed Rates . . . Contract terms call for a 20-year agreement starting Sept 15, 1953, a rescinding of PGE's present short-term contract signed in 1951, no change in the existing exchange account plan related to regional pooling operations, and wholesale power rate of $17.50 per kw-year and peaking demand at $0.75 per kw per month.

In addition to this, as an adjustment for diversity of flow at several points of delivery, PGE is to pay monthly 11.85 mills per kw of billing demand for energy and peak billing demand, or the contract demand.

In spelling out how amounts of energy to be sold to PGE may be changed, the contract states that after five years sales of energy to the company can be adjusted as "in the judgement of the administrator a part of the electrical energy is likely to be needed" by public power groups.

Under resale provisions of the contract BPA could terminate the contract on four years' notice if resale rates are considered unreasonable and discriminatory. The purchaser, however, has the right to ask for a review of any such cancellation in the U. S. District Court of Oregon.

BPA may not, without PGE's consent, include in public agency requirements schedules amounts of 10,000 kw or more in any one year for public agency delivery to new or existing industrial customers. BPA is further prohibited from adding to direct industrial customer loads if the administration has not agreed to supply the private company's firm power requirements in the same period.

New proposal will allow BPA to amend, supplement or replace industrial contracts if the subsequent agreement (1) does not extend the term or increase firm power commitments; (2) extends the term but carries out any geographical preference in use of electricity as provided by law; or (3) extends the term but reduces Bonneville's obligation to limit firm power to industrials whenever PGE's production of energy from steam power is in excess of a certain limit.

However, this last condition is contingent upon the industrial customer being able to obtain firm power elsewhere at average cost per kwhr of all firm energy then being produced in private company steam plants.

One private utility executive expressed disappointment over absence of provision for Bonneville to absorb excess steam costs in a critical water year, although admitting the remedy is a legislative rather than a contractual one. In view of the limited amounts of firm power available, he said, an exchange agreement whereby companies could swap steam power

Table I—Federal Capacity Scheduled For Pacific Northwest

Project and Units	Total Nameplate Capacity Megawatts	Dates of First and Last Units in Service
Detroit—2	100	June 1, Oct 1, 1953
Hungry Horse—4	285	Nov 1952; Nov 1, 1953
Big Cliff—1	18	Apr 1, 1954
McNary—14	980	Dec 1, 1953; Dec 1, 1956
Albeni Falls—3	42.6	Aug 1, 1954; Apr 1, 1955
Dexter—1	15	Apr 1, 1955
Lookout Point—3	114	Oct 1, 1954; Feb 1, 1955
Chandler—2	12	Sept 1, 1955
Chief Joseph—16	1,024	Sept 1, 1955; Dec 1, 1958
The Dalles—14	1,119	Nov 1, 1957; Nov 1, 1960

* California Oregon Power, California-Pacific Utilities, Idaho Power, Montana Power, Mountain States Power, Pacific Power & Light, Puget Sound Power & Light and Washington Water Power Companies.

Table II—Estimated Minimum Energy Available to Private Companies*

Sept 16 to Apr 15 (Fiscal Year)	1,000 Kwhr
1954	401,952
1955	819,168
1956	1,531,488
1957	1,938,528
1958	2,615,232
1959	3,637,920
1960	3,551,424
1961	2,966,304
1962	2,371,008
1963	1 755,360
1964	981,984
1965**	152,640

* Predicated upon minimum water conditions
** None available in subsequent years

when needed for hydro power when available might be more mutually beneficial. "BPA benefits by private ownership of this steam—they know they can fall back on it," the spokesman declared.

In looking over the proposed contract some observers felt there is more shadow than substance to what private companies may get, aside from a curb on direct industrial sales by BPA. Load forecasts indicate there may be 722,000 kw available for private companies by 1958-59, but this will steadily decline if predictions for public power agencies bear out.

Fight Looming . . . Direct industrial customers of BPA, who last year paid in almost 45% of all the agency's revenues, are going to fight this long term contract.

Within a week of the day BPA sent copies of the proposed agreement to customers and public utilities for comment, the major aluminum, metal alloy and chemical companies had organized a committee and began formulating a protest to Secretary of the Interior Douglas McKay and BPA Administrator Paul J. Raver. Top management executives of major firms left for eastern home offices to rally support closer to the nation's capital.

A spokesman for the industries declared they consider the proposed contract a death sentence for future expansion, an infringement on their existing contracts and renewal status and violation of the preference clause of the Bonneville Act as it refers to future industrial loads that PUD's might want to contract.

One source close to major customers declared that if it came to a battle of private assets with a decision to be made in the nation's capital, perhaps at cabinet level, the private utilities may have a rough time. He read off the list of BPA customers and said "who's bigger."

San Francisco PUC Asks Hetch Hetchy Rate Hike

San Francisco's Public Utilities Commission has asked the city for a Hetch Hetchy Water Supply and Power Project rate increase to rescue it from its six months old predicament of buying supplemental power from Pacific Gas & Electric Co to sell to the Riverbank Ordnance plant at a loss.

Since November, when PG&E raised its rates, the city has lost $10,800 on power sales to the plant, according to Harry E. Lloyd, Hetch Hetchy Project manager and chief engineer.

The proposal would allow the city to raise power rates for the Riverbank plant to the PG&E level. It would not affect city department power purchases.

(*Continued on page* 259)

Today in Utility Finance

YIELDS (%)

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE 1953									
June 4	**3.36**	**3.50**	**3.66**	**4.44**	**4.67**	**4.84**	**5.33**	**5.82**	**6.02**
May 28	3.34	3.45	3.64	4.36	4.60	4.81	5.21	5.70	5.94
END OF QTR.									
1st 1953	3.15	3.23	3.39	4.16	4.41	4.66	4.95	5.24	5.50
4th 1952	2.99	3.03	3.14	4.06	4.22	4.59	4.98	5.33	5.62
3rd 1952	2.99	3.03	3.16	4.10	4.26	4.61	5.18	5.59	5.96
2nd 1952	2.95	3.00	3.09	4.05	4.31	4.60	5.38	5.85	6.42

Data: Reis & Chandler, Inc.

EARNINGS

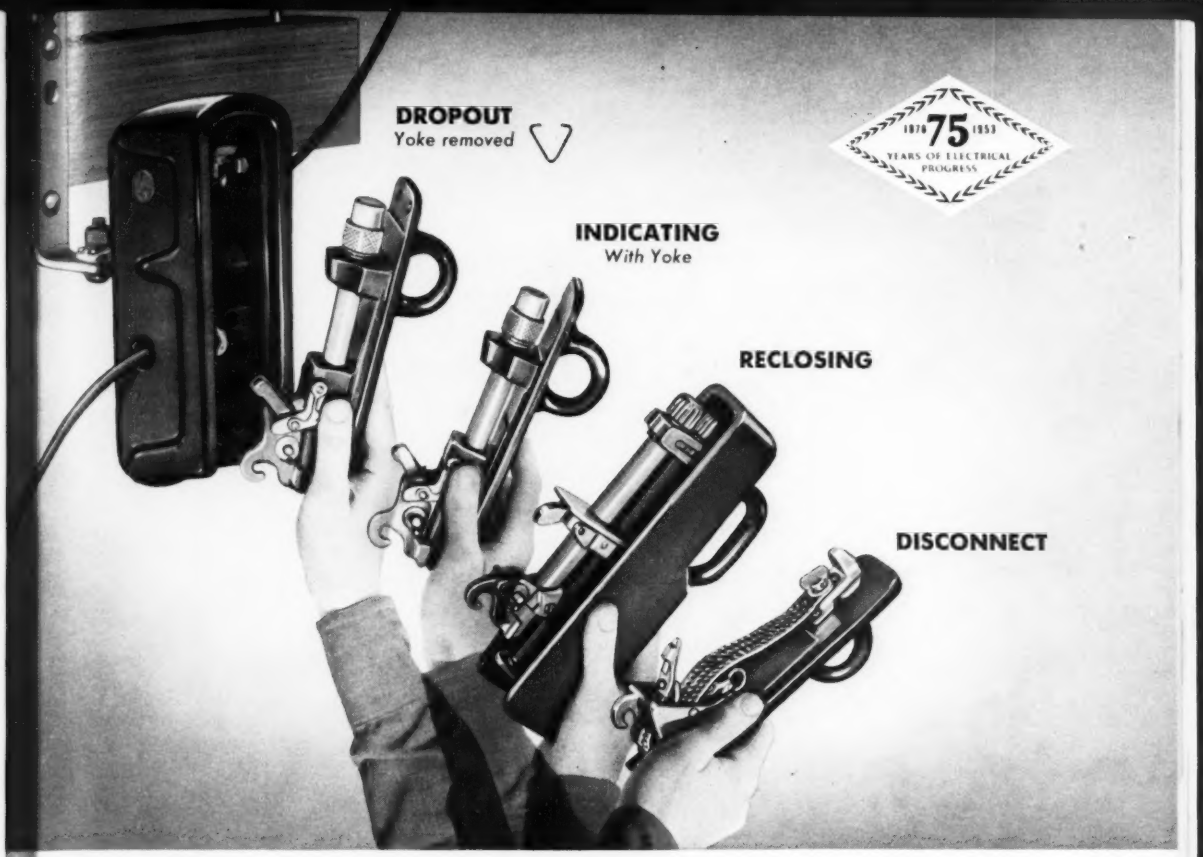
Company	Period Months Ended		Net Income 1953	Net Income 1952	Earnings Per Common Share 1953	Earnings Per Common Share 1952
Arizona Public Service	12	April	$3,458,000	$2,568,000	$....	$....
Consumers Power	12	April	21,161,338	19,979,257	2.62(a)	2.69(a)
Detroit Edison	12	April	19,186,182	15,659,393	1.84(b)	1.64(b)
El Paso Electric	12	April	1,570,377	1,502,467	1.97	1.88
General Public Utilities, consolidated	12	April	18,071,080	15,246,680	2.12(c)	1.91(c)
Gulf States Utilities	12	April	7,681,760	6,120,117	1.99	1.54
Iowa Southern Utilities	12	April	1,264,191	802,088	1.81(e)	1.20(e)
Public Service Co of Indiana	12	April	10,649,362	8,943,287	2.48(f)	2.29(f)
Tampa Electric	12	April	2,460,290	1,832,379	3.48(g)	3.06(g)
West Penn Electric, consolidated	12	April	13,160,001	11,523,583	3.11(h)	2.90(h)

Notes—(a) Based on 6,794,362 shares in 1953 and 6,176,693 shares in 1952; (b) Based on 10,420,913 shares in 1953 and 9,557,763 shares in 1952; (c) Includes all subsidiaries and is based on shares outstanding at end of period; (e) Based on 610,865 shares in 1953 and 552,165 shares in 1952; (f) Based on 3,780,768 shares in 1953 and 3,578,655 shares in 1952; (g) Based on 651,776 shares in 1953 and 598,441 shares in 1952; and (h) Based on 4,224,000 shares in 1953 and 3,960,000 shares in 1952.

FINANCING

Company and Description	Amount of Offering (000)	Offering Price	Yield to Public
WEEK OF JUNE 4-10			
Bonds			
Consolidated Gas, EL&P of Baltimore—1st mtg 3⅞% due 1983	$25,000	102.239%	3.75%
Gulf Power—1st mtg 4¼% due 1983	7,000	101.295	4.05
Arkansas Power & Light—1st mtg 4¼% due 1983	18,000	101.706	4.15
Common Stock			
American Gas & Electric—800,000 sh	$23,200	$29.00	5.66%
New England Electric System—828,516 sh (being offered commonholders on 1-for-10 basis, record June 11 to expire June 25)	9,942	12.00	7.50
San Diego Gas & Electric—800,000 sh (being offered on 1-for-3 basis, record June 9 to expire July 2; unsubscribed shares up to 100 to be offered employees)	10,640	13.30	6.02
Derby Gas & Electric—47,039 sh (being offered commonholders on 1-for-6 basis record June 1 to expire June 17; unsubscribed to be offered to officers and employees on the basis of not less than five shares nor more than 150 shares)	882	18.75	7.47
SCHEDULE FOR JUNE—JULY			**Bid Date**
Bonds			
New Jersey Power & Light—1st mtg due 1983	$5,500	.....	June 16
Pennsylvania Electric—1st mtg due 1983	12,500	.....	June 30
Commonwealth Edison—1st mtg	40,000	.....	July 8
Consumers Power—1st mtg due 1983	25,000	.....	July 16
Metropolitan Edison—1st mtg due 1983	8,000	.....	.....
Preferred Stock			
Kansas Power & Light—50,000 sh $100 par	$5,000	.....	June 17
Western Light & Telephone—78,202 sh cum conv $25 par (one sh of preferred being offered to commonholders for each five shares held of record June 9; offer expires June 23)	.....	.....	.....
Common Stock			
Gulf States Utilities	$6,000*	.....	June 30
Boston Edison—246,866 sh (to be offered commonholders on 1-for-10 basis)	.....	.....	.....
Bangor Hydro Electric—45,254 sh (to be offered commonholders on a 1-for-6 basis, record June 16 to expire July 1)	.....	.....	.....

Notes— *—To sell enough common stock to yield $6 million before payment of issuance expenses.



1876 75 1953
YEARS OF ELECTRICAL PROGRESS

4 cutouts in 1—a G-E feature since 1937

STILL YOUR BEST CUTOUT BUY... Flexible, reduces inventory and simplifies stocks

A simple change of doors and you can have either (1) indicating; (2) dropout; (3) reclosing; or (4) disconnecting cutouts in either 50-ampere or 100-ampere ratings, 5.2 or 7.8 kv. The unique flexibility provided by these fuse cutouts permits you to stock fewer parts. Each door in the same current rating is interchangeable on either the 5.2 or 7.8-kv housings; inventories are smaller, stocking and handling costs less.

Cutout is liberally designed . . . has high dielectric and mechanical strength, uses silver-plated contacts, provides full-range interruption of fault currents, and is conservatively rated.

Indicating or dropout with a twist of the wrist . . . a small wire yoke, easily inserted or removed, determines whether the fuse holder door "kicks-out" at the bottom or drops completely open—either way gives positive evidence of a blown fuse.

Reclosing door avoids unnecessary service trips . . . two-element reclosing door restores service within one second after a temporary fault blows the first fuse link. A red indicator, easily seen from the ground, projects below door of cutout. If second fuse blows, toggle permits door to drop completely open.

Flexible disconnect blade can't get lost . . . it's fastened to the door. This disconnect blade doubles the continuous rating of the cutout. When the blade is disconnected and the door closed, the flexible cable extends downward to indicate that the circuit is open.

Since these G-E cutouts were introduced in 1937, all parts have been interchangeable even though several improvements have been made. You can put a 1953 door on a 1937 housing and it will fit. No other basic design of enclosed fuse cutout offers such complete flexibility and economy of operation.

For full information, contact your G-E Apparatus Sales Representative, or write for Bulletin GEA-3448, General Electric Co., Section 433-3, Schenectady 5, New York.

You can put your confidence in—

GENERAL ELECTRIC

DISTRIBUTION TRANSFORMERS
different from others because..

...Nitrile rubber gaskets at *all* tank openings prevent breathing...seal out contamination

You get years of extra service from your General Electric Spirakore* distribution transformer because "we stopped their breathing to prolong their life." **EVERY OPENING**—cover, handhole, high- and low-voltage bushings—is sealed with a nitrile rubber gasket. These gaskets resist oil, sunlight and atmosphere . . . they require no cement . . . are easily removed *and used again and again.*

This air-tight seal maintains the high dielectric strength of the oil . . . prolongs the life of the insulation.

REMEMBER . . . all transformers are not alike . . . compare the General Electric plus features in the chart below and see for yourself.

For more information on distribution transformers, either unit-type or conventional, contact your nearest G-E sales office, agent or distributor, or write to General Electric Company, Section 431-5, Schenectady 5, New York.

*Registered trade-mark of General Electric Co.

You can put your confidence in—

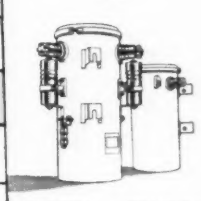
GENERAL ELECTRIC

ALL TRANSFORMERS ARE NOT ALIKE

(make this simple comparison and see)

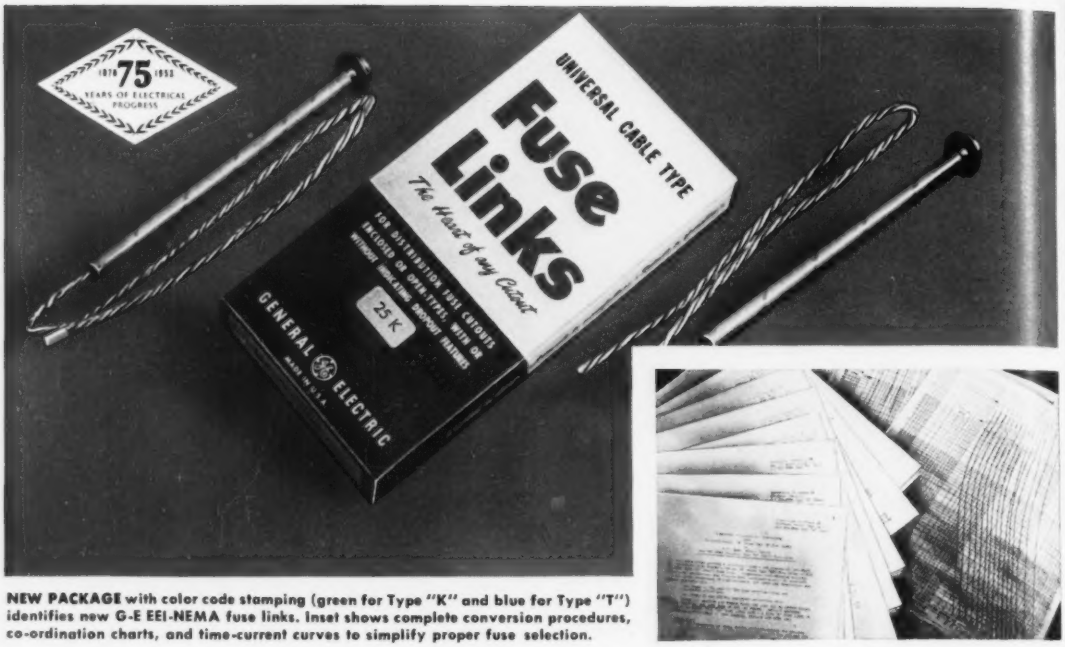
FEATURE	General Electric	Mfr. A	Mfr. B	Mfr. C	Mfr. D	Mfr. E
Production-line impulse testing	YES	NO	NO	NO	NO	NO
Nitrile rubber gaskets at all tank openings	YES	NO	NO	NO	NO	NO
Strenicor pressure terminal clamps	YES	NO	NO	NO	NO	NO
Insulated clamp-type connectors on tank wall hv bushings	YES	YES	YES	NO	YES	YES
One-piece cover band	YES	NO	NO	NO	NO	YES
Gapped valve-type arresters	YES	NO	NO	NO	NO	NO
Nationwide company-operated service facilities	YES	YES	NO	NO	NO	NO

1876 75 1951 YEARS OF ELECTRICAL PROGRESS



UNIT-TYPE CONVENTIONAL

"Take your choice G. E. makes both"



NEW PACKAGE with color code stamping (green for Type "K" and blue for Type "T") identifies new G-E EEI-NEMA fuse links. Inset shows complete conversion procedures, co-ordination charts, and time-current curves to simplify proper fuse selection.

G-E's new EEI-NEMA universal cable-type fuse links provide extra benefits from fuse link standardization

And it's Easy and Economical to Convert to G-E Standard Links

GENERAL ELECTRIC'S new EEI-NEMA standard fuse links not only meet all of the utility-sponsored EEI-NEMA requirements, but also offer many additional operating benefits. They provide both electrical and mechanical interchangeability . . . long desired by users . . . and there's a Type "K" (fast) and a Type "T" (slow) G-E standard link in both preferred and non-preferred ratings, for replacing practically any nonstandard links now in use.

G-E's standard links give EXTRA benefits. Low melting temperatures prevent drying, embrittling, or burning of auxiliary tubes or fuseholder tubes . . . thereby maintaining the full interrupting capabilities of the cutout.

Extra-long auxiliary tube gives greater dependability for low fault currents, and better full-range operation of any cutout.

High continuous-current-carrying capabilities enable continuous over-current rating in excess of standard ratings, and simplifies replacement of N-rated links with practically no change in equipment protection.

Higher accuracy of electrical characteristics gives you greater assurance of attaining planned protection and co-ordination, with more dependable isolation of faults and minimizing of system outages.

Mechanical construction combines liberal strength of fusible element and strain wire with extremely flexible cable that permits free indicating and dropout action of cutouts.

It's easy and economical to convert to G-E standard links—there's no need for a new co-ordination study—in general, you simply replace section and branch fuse links with the proper G-E Standard fuse links; thereafter you replace equipment fuses with G-E Standard fuse links at the most opportune time—when equipment fuses blow or as equipment is serviced. You won't have to throw away your present equipment fuse links.

There's a G-E Standard fuse link to give practically the same equipment protection as any "N" rated fuse link you are now using.

For information, get in touch with your nearest G-E representative, or write to General Electric Co., Section 433-1, Schenectady 5, New York.

You can put your confidence in—

GENERAL ELECTRIC

Machine Equipment Calculates Transmission Line Constants

R. H. RANKIN
O. TORSETH
Branch of System Engineering, Bonneville Power Administration, Portland, Ore.

Coefficients of "long-line" current and voltage equations, commonly referred to as ABCD constants, are literally being mass produced on an IBM type 602-A caculating punch in the system planning section of Bonneville Power Administration. Using these mass production methods, it has become feasible to compute general constants in quantities that would otherwise be prohibitive if done in the conventional manner using a desk calculator.

As part of BPA's machine accounting equipment, the calculating punch is particularly adaptable to solution of problems requiring repetitive calculations. Because method of calculating ABCD constants is readily systematized, the problem represents an ideal application of this machine.

To date compilations similar to the table have been made of constants for 21 line configurations for distances of from 100 to 600 miles in five-mile increments. They are such that line constants for spacings or conductors different from those actually calculated can be found by interpolation to a degree sufficiently accurate for most purposes.

Need for these calculations arose from numerous and time-consuming computations made in line performance and comparative transmission economic studies. Two months were required from initial planning stage to completion of calculations. However, considerable time was spent in programming and wiring the plug board controlling sequence of machine operations because eight different wiring arrangements were necessary. Nevertheless, it is estimated that two man-years would be required to perform these computations on a desk calculator.

With experience gained on the initial problem, a similar set of calculations could be completed in less than one month. Of this month, actual machine calculations would con-

CALCULATING PUNCH of type IBM 602-A is used to solve transmission line problems involving repetitive calculations that become prohibitive if attempted manually

Line Constants for 400,000-Cir Mils Copper Equivalent ACSR Conductor with 25.2-ft Equivalent Spacing

Miles	A_1	A_2	B_1	B_2	C_1	C_2
105	0.976808	0.004294	15.1955	83.748	0.000000778	0.00054740
110	0.974557	0.004633	15.8948	87.673	0.000000896	0.00057304
115	0.972202	0.005059	16.5909	91.589	0.000001024	0.00059862
120	0.969746	0.005504	17.2830	95.492	0.000001162	0.00062411
125	0.967184	0.005967	17.9718	99.388	0.000001312	0.00064956
130	0.964518	0.006448	18.6565	103.275	0.000001479	000067494
135	0.961751	0.006947	19.3375	107.151	0.000001656	0.00070025
140	0.958892	0.007464	20.0145	111.013	0.000001842	0.00072546
145	0.955919	0.007999	20.6878	114.867	0.000002046	0.00075062
150	0.952853	0.008551	21.3552	118.709	0.000002266	0.00077570
155	0.949690	0.009121	22.0190	122.536	0.000002495	0.00080068
160	0.946413	0.009708	22.6780	126.353	0.000002742	0.00082559
165	0.943044	0.010313	23.3327	130.157	0.000003002	0.00085041
170	0.939574	0.010934	23.9819	133.949	0.000003283	0.00087516
175	0.936008	0.011573	24.6255	137.723	0.000003579	0.00089978
180	0.932338	0.012228	25.2646	141.486	0.000003890	0.00092432
185	0.928569	0.012900	25.8980	145.235	0.000004221	0.00094877
190	0.924714	0.013589	26.5256	148.967	0.000004569	0.00097311
195	0.920746	0.014294	27.1476	152.685	0.000004937	0.00099735
200	0.916690	0.015015	27.7643	156.390	0.000005323	0.00102150
205	0.912526	0.015753	28.3746	160.076	0.000005727	0.00104553
210	0.908279	0.016506	28.9786	163.745	0.000006152	0.00106944
215	0.903922	0.017276	29.5772	167.398	0.000006598	0.00109324
220	0.899476	0.018060	30.1689	171.036	0.000007058	0.00111694
225	0.894940	0.018861	30.7543	174.652	0.000007539	0.00114049

$A = \cosh \sqrt{ZY} = \cosh (\alpha - \beta j) = \cosh \alpha \cos \beta - j \sinh \alpha \sin \beta$
$A_1 = \cosh \alpha \cos \beta \qquad A_2 = \sinh \alpha \sin \beta$

sume about one week. Remainder of the time would be required to perform calculations not yet mechanized, such as computing surge impedance and admittance and hyperbolic angle $\sqrt{ZY}$.

Line constants were calculated in terms of hyperbolic and circular sine and cosine functions. Calculator has no means of storing large groups of numbers such as would be required for a table of functions. Therefore, a method of interpolation was used to obtain values of functions for various configurations and distances. Machine was wired to solve an interpolation formula of the type

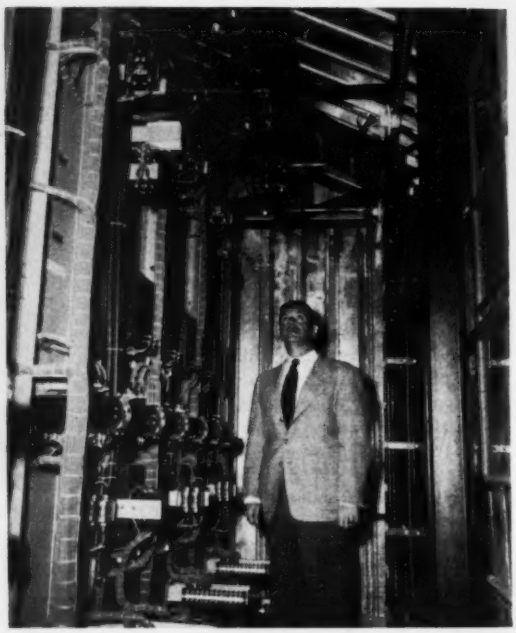
$$f(u) = A - U\ [B+D+u(C-Du)].$$

Sets of differences were fed into it and results were obtained on punched cards.

Accuracy of interpolation process can be controlled by including proper number of terms in interpolation formula. In this case interpolation is accurate to six significant figures.

Planning has been completed for calculating power losses and reactive requirements of subject lines as a function of power flow and voltage level utilizing constants previously found. These calculations will provide results more accurate than can be obtained from a circle diagram or variations thereof. Next problem to be programmed is determination of most economic system operating voltage level for large grid system.

UNIT MOUNTING PLATES for relays, control switches and instruments allow boards to be built in sections 24 in. wide and 90 in. high



BACKBONE WIRING for various panel elements is attached to reinforcing rod bolted to panel frame as panels are added or removed

Unit Mounting Plates Cut Installation Costs One-Third

E. W. **HUTLOFF,** Supervisor, Relays & Controls, Arizona Public Service Co, Phoenix

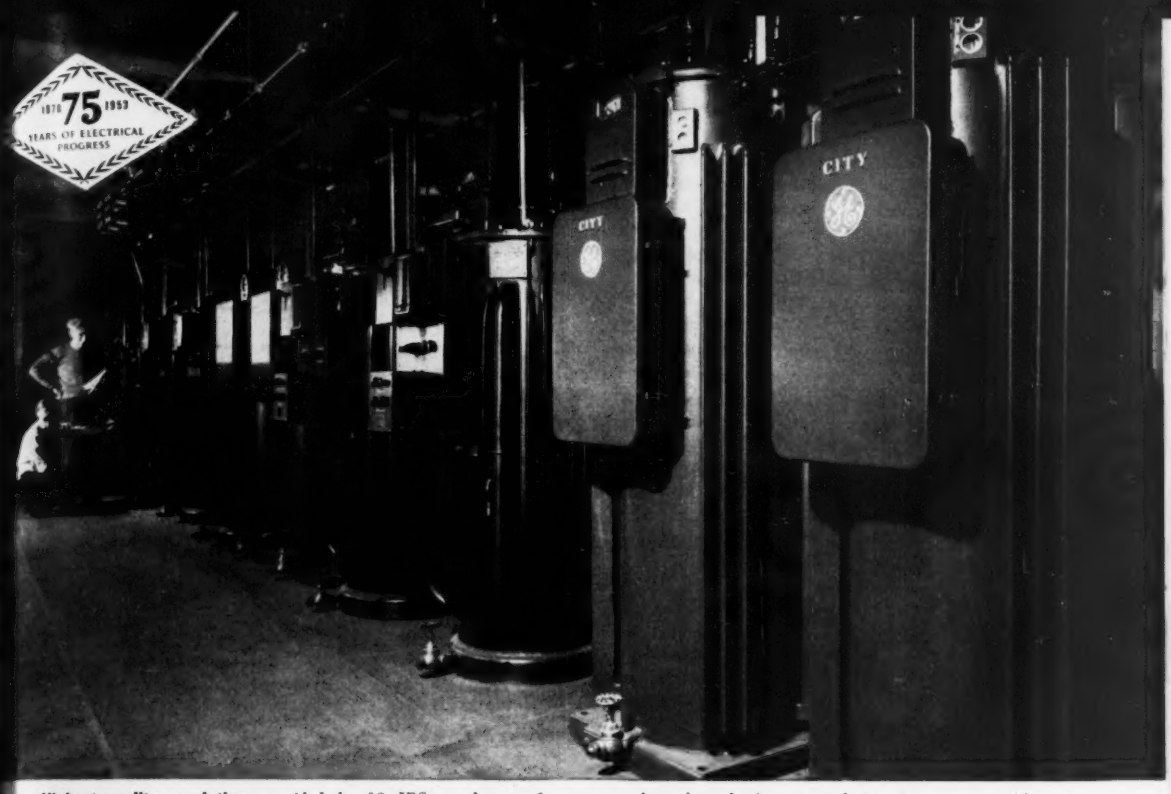
Flexibility in adding, removing or changing various elements on steel control boards is gained through use of unit mounting plates. Savings of about one-third in time and labor, plus the advantage of neat-appearing panels, are also offered by this scheme. In addition, easier and more economical installation and removal of temporary panel boards result.

Formerly when individual elements had to be moved or replaced, it was often necessary to plug small holes or add metal plates to cover larger areas. This procedure not only consumed unnecessary time and labor but also left control boards in an unsightly state. Under the new scheme, instruments, relays, control switches and other control panel elements are mounted on individual mounting plates, which are sized to combine into an overall panel unit measuring 90 in. high by 24 in. wide. Plates are easily attached to channel-iron framework of panel by corner screws.

After some experimentation, the maximum number of different size plates was narrowed down to 12. All plates are 12 in. wide. Further, a mark number system was devised so that plates could be identified easily. Most commonly used plates, and their heights, are:

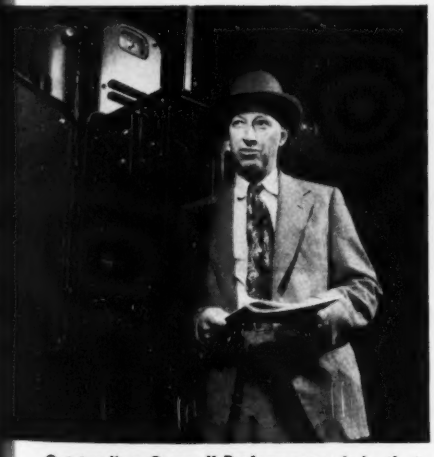
Mark Number	Height, in.
P01	8
P02	8½
P03	10⅜
P04	11 11/16
P07	15 1/32
P10	22 5/32

These numbers designate blank



Highest quality regulation provided by 12 IRS regulators of Western Mass. Elec. Co. maintains consumer goodwill. Passing years have brought important design improvements, but even oldest units continue to provide accurate stepless regulation.

Utility Gets 21 Years of Top-notch Service From G-E Induction Voltage Regulators



Outstanding Over-all Performance. J. L. (Joe) Hyland, Supervisor of Stations, Northern Division, is thoroughly pleased with the ease of adjustment and low maintenance of IRS regulators.

Consumers get faster, closer voltage correction . . . utility reaps added benefits of reduced maintenance

J. L. (Joe) Hyland, Supervisor of Stations, Northern Division of the Western Massachusetts Electric Company, reports that the Company installed its first four G-E Type IRS single-phase induction voltage regulators at its Greenfield Substation back in 1931.

Their over-all performance and ease of adjustment so impressed company officials that they have added only G-E induction regulators at the substation since. Twelve have been installed to date—and they have been in operation almost continuously.

Protect consumer goodwill. The ability of these regulators to respond immediately to voltage changes and the resulting close regulation assure the type of service that protects valuable consumer goodwill.

They require less maintenance. Because of the rugged simplicity of the IRS design, these regulators have needed little maintenance. There are only three moving parts, which are mounted on enduring roller or ball bearings and coupled through double worm gearing. On the units built since 1940, no lubrication is necessary because the complete mechanism (including the motor) is immersed in oil.

For more information on the performance of IRS regulators, ask your G-E Apparatus Sales representative for Bulletin GEA-2985. Or write *General Electric Company, Schenectady 5, New York.* 404-94

GENERAL ELECTRIC

plates. When a relay or other instrument is mounted on a plate, the letters A, B, C, etc, are added as a suffix to the blank plate number to give designations such as P01-A, P02-A, P01-B, P02-B, etc. All plates are made of 12-gage sheet steel and are fabricated to a tolerance of plus 0.0 in. and minus 0.031 in. on width and plus 0.0 in. and minus 0.015 in. on length. Mounting holes in each corner are $\frac{7}{16}$ in. Costly installation time and labor may be saved by having commonly used mounting plates prefabricated and stocked for future use.

Two panel frameworks to take mounting plates are used, one for a standard line panel and another for a standard feeder and standard transformer panels. Frames consist of two 3-in. channels and two 1½ x 1½ x $\frac{3}{16}$-in. angles, with channels forming the sides and angles the center. A 24 x 3 x ¼-in. flat mild steel plate welded at top and bottom complete the panel frame. Top plate is drilled for angle braces which attach to wall supports and bottom plate for floor bolts.

Channel sides are drilled so that they may be bolted to another panel, either of the same construction or of the old type of steel panel. Channel flanges on frame's front are drilled and tapped to take mounting plates. Channel flanges on rear of frame are drilled and tapped near the top for mounting brackets for test switches and fuse blocks, and near the bottom for mounting brackets for terminal blocks and ground bus.

Back-bone method of wiring has been devised to eliminate unnecessary time and labor, and difficulties in making wiring changes associated with use of channel sides of a manufacturer's panel. In this back-bone method, a reinforcing rod is bolted to the two center angles, using the same bolts that hold the angles together. Switchboard wires are laced onto this rod.

For revisions in the wiring a harness can be pre-made for various standard relay and control schemes and installed with mounting plates. If panel elements must be changed, plates and harness can be removed together and saved for future use.

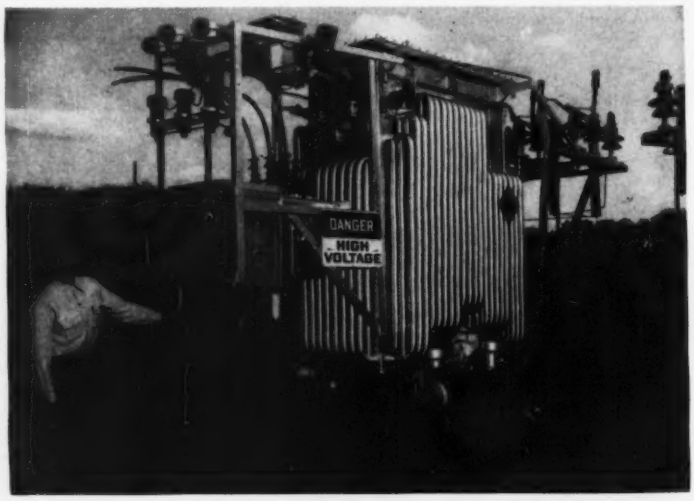
Panels of unit mounting plates are designed for use in new or existing control rooms. When placed adjacent to old panels, control switches, relays, instruments, etc, will align horizontally to give a neat and orderly arrangement.

Gin Stick Supports Heavy Wires

Heavy wire is lifted into position, after it has been pulled to proper tension, with a new gin stick suggested by lineman Elmer Becker and developed by the electrical engineering department of Waterloo district Iowa Public Service Co's Waterloo district. The gin stick is lightweight, made of ¼-in. square hollow steel tubing. It was cut, bent and welded to slip over the crossarm and tilt back into a stationery position. There are no bolts and nuts, and nothing for linemen to fuss with.

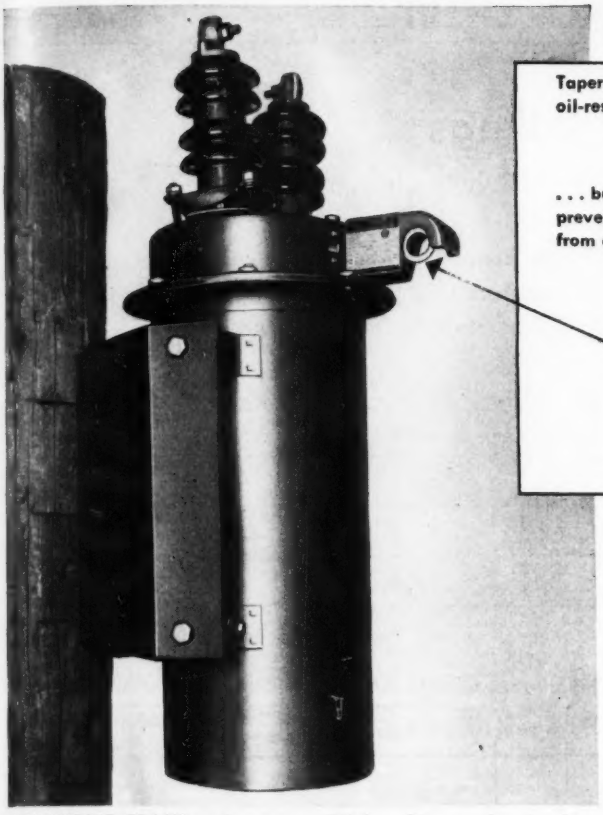
The pulley of a hand line is hooked into the eye at the top of the stick and one end of a hand line is attached to the wire. Groundmen then lift the wire and the lineman guides it into position on the insulator. It saves the lineman from stretching and lifting, prevents strained backs, and reduces the chance of gaff hooks breaking out, and inflicting further injury.

GIN STICK HOOKS over crossarm without bolting or fussing. Handline pulley is hooked into ring at top of stick and one end of hand line is attached to the wire. Men on ground do lifting, reducing linemen injuries



Portable Substation Saves 50%

Complete installation in 3 hours and a 50% saving in cost can be affected by this portable substation compared with a standard substation installation. Easily handled on a tractor trailer, the transformer provides an additional 1,250 kva in substation capacity and may be used on all 13-2.4/4.8-kv installations. Connections are made by means of flexible No. 2 leads 50 ft long for the 13,000-v side and No. 2/0 leads 30 ft long for the 2,400-v side. All leads are specially insulated with extra thick insulation to prevent damage from other heavy equipment while on the ground. The Substation and Shop Departments of the Tampa Electric Co, designed and built the four units now in use. **E. S. Geiger, Supt of Transmission and Distribution, Tampa Electric Co, Tampa, Fla.**


Tapered rubber seal, cemented to handle housing with oil-resistant cement, allows gas to escape from tank . . .
. . . but prevents air from entering
Operating Shaft
Recloser Hood Wall
Trip-free handle permits recloser to lock-open, even though hook stick is held in closed position

140-AMPERE FRAME recloser, new "U-shaped" mounting bracket.

ONE-WAY VALVE SEAL combined with sealing of other parts of recloser, effectively cuts maintenance to a minimum. The sealed unit is the latest in a series of G-E design advances for reclosers—a series that included introduction of the first automatic recloser in 1934, and the recent introduction of the "hold-closed" operation.

- **Keeps out moisture**
- **Cuts maintenance to minimum**
- **Permits interruption gases to escape**

G. E. introduces new "sealed handle" unit, seals recloser from moisture and dust

Exclusive feature on Type FR Automatic Reclosers up to 140 amps

With General Electric's sealed unit Type FR automatic oil circuit recloser, utilities can now eliminate their biggest recloser maintenance problem caused by moisture accumulation in the oil. They also can count on reclosers remaining in service, untouched for long periods of time, with maintenance intervals determined chiefly by interrupting duty imposed.

SEALS AGAINST WEATHER The one-way valve seal around the shaft of the recloser handle, shown in close-up above, seals against rain, snow and dust. In keeping out moisture-laden or dusty air, the seal prolongs the insulating ability of the oil . . . and permits easy escape of gases created by fault interruptions.

Type FR Reclosers are also available to co-ordinate completely with those of other manufacture.

Design-tested in G.E.'s High Capacity Development Laboratory, the "sealed unit" Type FR Automatic Recloser comes in the one-phase FR-1 model and in the three-phase FR-3—continuous current of 5 to 140 amps, interrupting capacity of 125 to 2500 amps at 2400 to 14,400 volts. For complete information on these reclosers, see your General Electric Sales Representative, or write to General Electric, Schenectady 5, N.Y.

872-5

1878 75 1953 YEARS OF ELECTRICAL PROGRESS

You can put your confidence in—

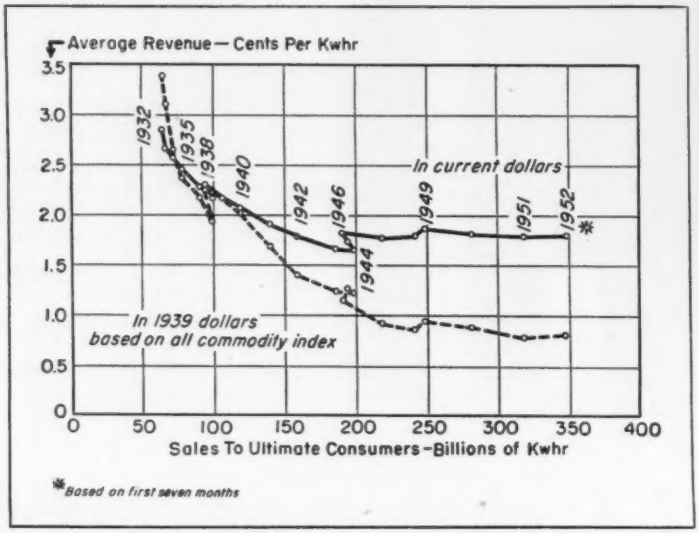
GENERAL ELECTRIC

Electricity Sales and Billings

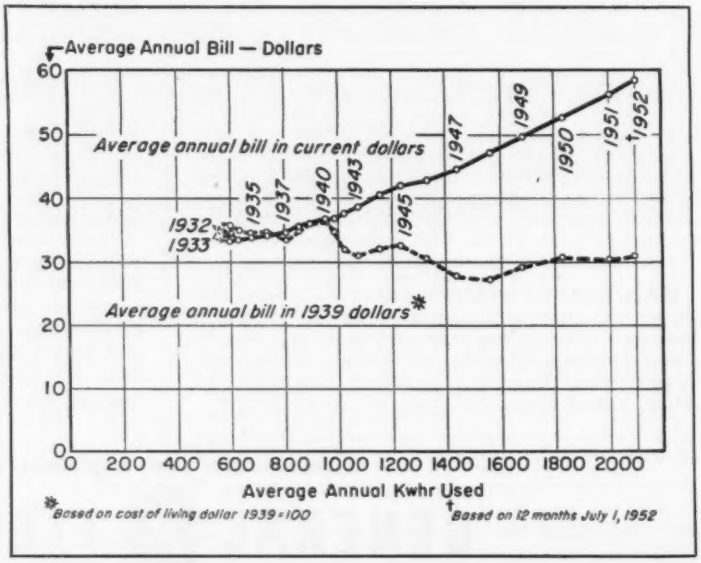
(Current Dollars vs 1939 Dollars)

Values given are for ultimate consumers (residential, commercial, rural, industrial) in the United States from 1932 through 1952. Graphs are adapted from data compiled by Ebasco Services Inc, New York, N. Y.

Sale of Electricity to Ultimate Consumers



Average Residential Electric Bill



MODERN G-E BOILER FEED PUMP MOTORS ARE INSTALLED IN NIAGARA MOHAWK'S NEW ALBANY POWER STATION.

IN DESIGN AND PERFORMANCE—

A True Power Station Motor

When side-air-discharge motor ventilation proved impractical for large boiler fed pump service, we reversed the air flow to expel the warm ventilating air high over the pump. This prevents recirculation of discharge air . . . permits close parallel spacing of motors . . . greatly improves personnel comfort.

In addition to ventilation changes, this modern cubical boiler feed pump motor incorporates the latest advances in bearings, insulation, rotor, and stator design. It's built to serve you with the year 'round reliability the vital power industry requires.

Some of the features of the G-E drip-proof Boiler Feed Pump Motor which make it a true power station motor from top to bottom are:

STREAMLINED ROTOR construction prevents "siren" effect—built-in deflectors and large discharge chamber cut overall noise level considerably.

DUAL LUBRICATION SYSTEM combines the advantages of force-flood lubrication and self-lubricated oil rings . . . gives extra protection . . . assures long, reliable bearing life.

COMPLETE 360 DEGREE ENDSHIELD supports bearing from top as well as bottom . . . assures continuous, accurate bearing lineup. Both endshield halves are sturdy ribbed castings.

For more information contact your nearest G.E. Apparatus Sales Office or write for Bulletin GEA-5813 to General Electric Co., Section 753-3, Schenectady 5, N. Y.

Conventional motor (top) expels heated discharge air into the aisle—G-E Boiler Feed Pump motor exhausts air high over the pump.

You can put your confidence in—

GENERAL ELECTRIC

RAISING WIRES for house moving jobs has been simplified by using the hydraulic tower truck

INSTALLING insulators on a 33-kw line job

Hydraulic Tower Truck Does Many Jobs

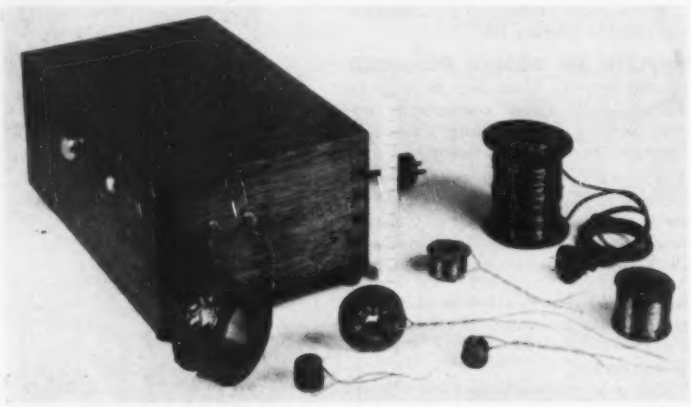
A hydraulic tower truck, purchased for overhead trolley maintenance, has been used for many other jobs on the St. Joseph Light and Power Co system. These include: stringing conductors; threading ropes through trees; supporting conductors over the street; checking clearances over signs and buildings; installing repair sleeves on aluminum conductors, on 12-kv circuits in mid span; tree trimming where side clearances are involved; making repairs on a congested pole where it would be difficult and hazardous to install enough rubber for protection of linemen; installing Christmas decorations in the city; for public relations purposes such as making pictures of parades, buildings and civic improvements; installing pot-heads at cable terminals; changing current and potential transformers on primary metering; and washing insulators.

C. A. LARSON, Manager of Electric Operations, St. Joseph Light and Power Co, St. Joseph, Mo.

Portable Magnetizer Uses Ac Supply

A compact, portable permanent magnet charger costing $50 to make has been developed by George M. Orr, National Bureau of Standards. It is supplied from 110-v ac source, draws 30 w, and provides a peak mmf up to 20,000 amp-turns. The field results from a capacitor discharge through a magnetizing coil.

Energy stored in a 6,500-μf capacitor bank, charged to 125 v by selenium rectifiers, is transferred to the magnetizing coil by a heavy-duty, 24-v, 70-amp, motor starting relay. Closed by a push button and supplied from capacitors, the relay opens automatically shortly before capacitor voltage is zero. This eliminates need for a high current interrupting switch required for other types of charges.

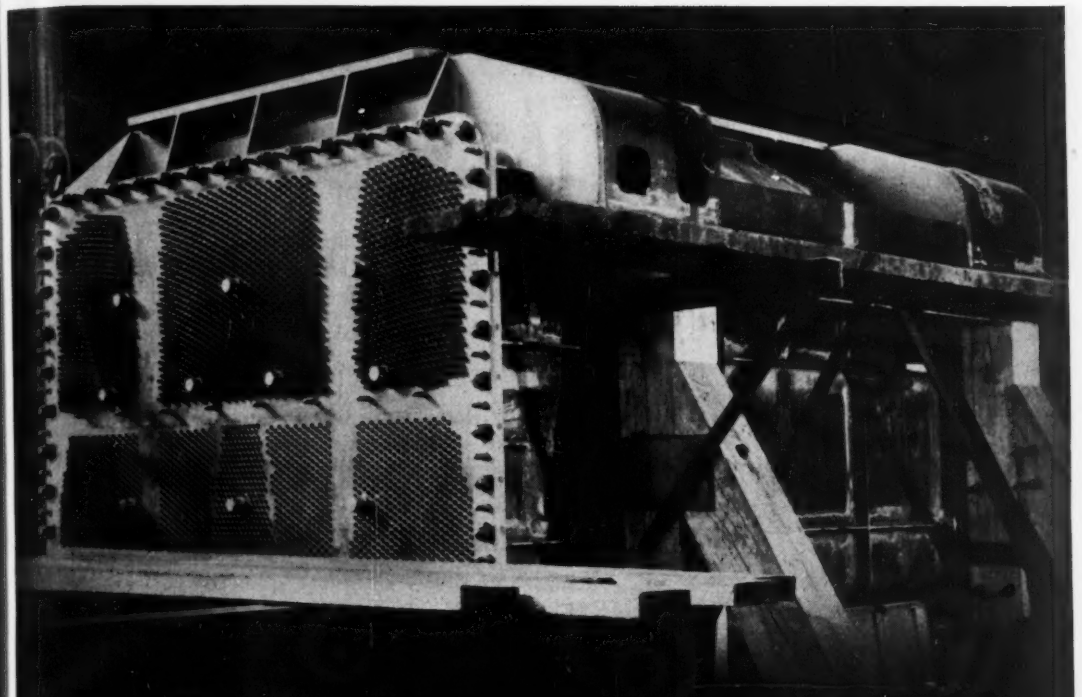


MAGNET CHARGER consists of coils and box with an isolation transformer, selenium rectifier, capacitor bank and relay inside. Large coil at right is an ac demagnetizing coil

Several magnetizing coils have been constructed to fit the shape of magnets. Iron yokes are necessary for multipolar or radial magnetizing. Simple layer-wound solenoids have proved satisfactory for general use. Optimum coils have 150 to 200 turns, a dc resistance of 0.3 to 1.0 ohm, and an inside diameter no larger than necessary for the magnet.

In typical operation, a peak current of about 150 amp flows during 2 milliseconds. Power consumption varies between 70 w (capacitor dis-

(*Continued on page* 140)



It will pay you as it has paid others to

Specify Revere

CONDENSER TUBES AND PLATES

It is significant that year after year important users of condenser tubes and plates specify Revere, not only for new equipment, but when re-tubing. You might consider this fact if you are not as yet a Revere customer.

Remember that Revere can give you more than tubes and plates. If you have questions regarding the most suitable alloy to meet operating conditions, the Revere Technical Advisory Service will be glad to collaborate with you on this subject. If your present tubes do not seem to be giving the service expected of them, the same Service will look into the matter. Such factors as vibration, air entrainment, water velocity, impingement attack, changed water conditions, tube composition, and others will be studied and recommendations made. In a great many cases we have pointed the way to greater tube economy, increased service life.

As part of our service to condenser operators we have prepared a 28-page booklet entitled "Life Extension for Condenser Tubes." Ask for it on your company letterhead and it will be sent free.

REVERE

COPPER AND BRASS INCORPORATED

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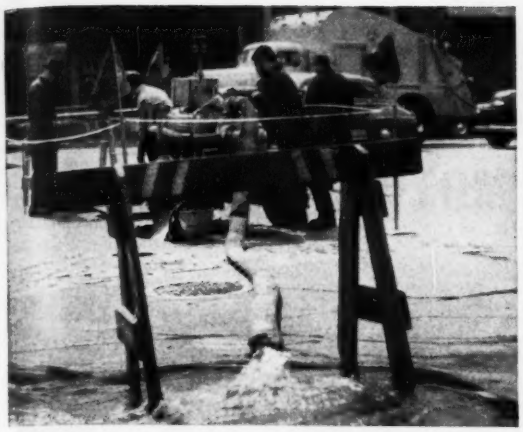
SEE REVERE'S "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY

NEOPRENE-JACKETED CABLE WITHSTANDS DAILY EXPOSURE TO OILY TIDEWATER

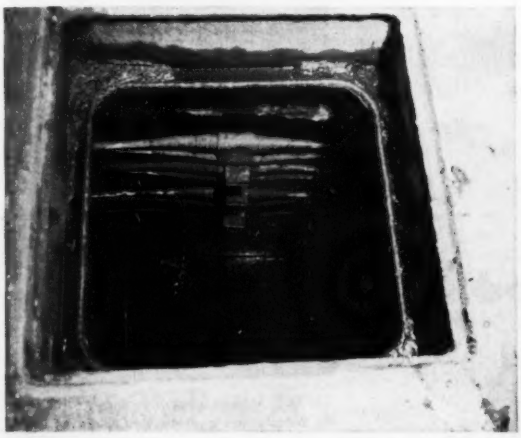
Consolidated Edison secondary network cables along East River in New York City are under water three hours out of every twenty-four

1. At each high tide, oily salt water from New York's East River floods through the maze of ducts along the Lower Manhattan waterfront and into the manholes. The secondary network cables in these ducts supply the piers and buildings with 120/208V service. A recent inspection of a manhole in this area was made by a crew from Consolidated Edison of New York to determine condition of the neoprene jacketing on the cable.



2. First step in the inspection was to pump out the 3½ feet of water standing in the manhole. The tide was running out at the time so the level was considerably below the high water mark for the day. The water discharged was extremely oily and contained river dirt and silt.

3. Before pumping, only the upper set of cables was above water. Consolidated Edison of New York normally installs secondary network cable in sets of eight 4/0 cables, two insulated cables per phase and two 4/0 "tinned copper" bare conductors for the neutral.



4. After pumping, the rugged conditions to which the cable is exposed were even more apparent. An oily grime covered the walls and floor of the manhole and was especially heavy around the duct openings. Examination of the neoprene jacketing on the cables showed it to be in excellent condition despite exposure to these conditions over several years.

5. Screen head on the hose end filters out objects which may damage pump. However, no such precaution can be taken with the cables. They must resist constant abrasion by river silt and foreign matter which flows in and out with the tides. Neoprene's toughness also permits jacketing to withstand movement under cyclic loading.

Ask your cable supplier about neoprene-jacketed cable made in single and multiple conductor types for a wide range of voltage ratings. Because of neoprene's superior properties, neoprene-jacketed cable can be installed with equal success in underground ducts, above ground, or buried directly in the earth.

NEOPRENE

The Rubber Made by Du Pont Since 1932

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Long a quality manufacturer of forest products (since 1895) J. Neils is a major producer of power and telephone poles.

At Libby, Montana, in the heart of a great forest empire, J. Neils manufactures and treats the poles that come from magnificent stands of Western Larch, Lodgepole Pine and Douglas Fir. This modern pole treating plant measures up to the highest quality standards in men, materials, equipment and methods.

An illustrated folder on J. Neils treated poles, and information regarding their application to your requirements, will be furnished gladly on request.

J N **J. Neils Lumber Company**

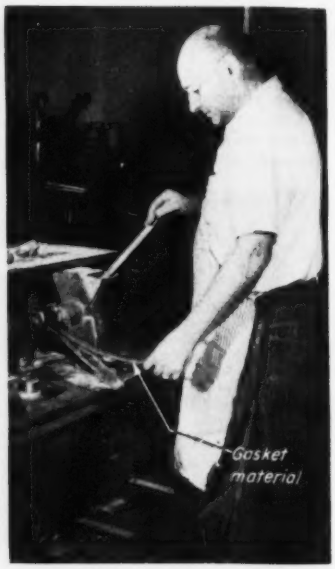
Pole Division: LIBBY, MONTANA

Portable Magnetizer

(*Continued from page* 136)

charged) and 10 w (capacitor charged). At normal rate of magnet charging, one pulse every 15 sec, the power consumption averages 30 w.

Small magnets have been satisfactorily charged with this magnetizer. Flashing larger magnets may not be fully effective because of the short magnetizing pulse duration.



GASKET MACHINE grinds out non-hardening transformer gaskets. Compound is reused

Machine Produces Re-Usable Gaskets

T. E. MUCHO, Apparatus Repairman, Electrical Construction Department, Shops and Tool Service, Commonwealth Edison Co, Chicago

A machine has been developed by Commonwealth Edison for making non-hardening gaskets to seal covers on distribution transformers. These gaskets, have performed more satisfactorily than the gaskets previously used.

This machine was constructed from a combination of parts of an old washing machine, including the wringer control and motor, and a sausage casing stuffer. The material, knife grade compound, is forced into the

(*Continued on page* 144)

ONLY $270 BUYS A PACKAGE OF FULLY AUTOMATIC FIRE PROTECTION

Anyone who can measure volume . . . and can cut pipe . . . can install this ready-made fully automatic fire extinguishing system that requires no power source.

It includes Kidde's split-second rate-of-temperature-rise heat detector (the fastest detection known to the fire-fighting industry), Kidde's powerful Multijet nozzle and a 50-pound cylinder of fire-killing carbon dioxide. You even get a monometer tester. Pipe and fittings are optional.

Six Kidde Standard Paks are available for volumes from 800 up to 6,000 cubic feet.

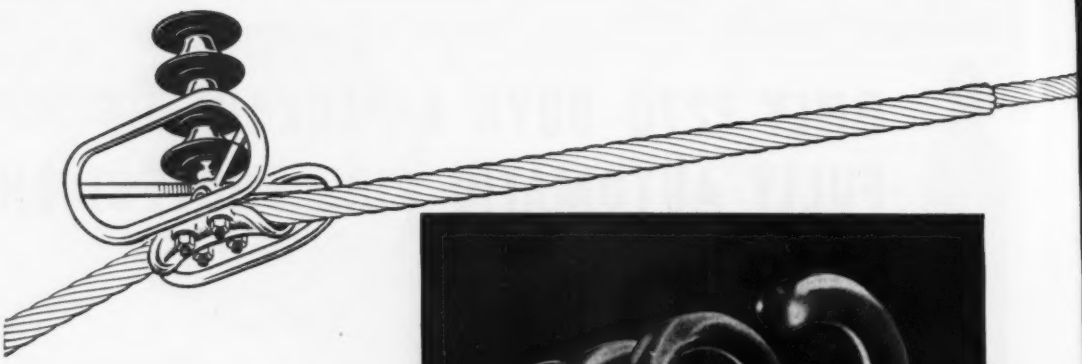
All components of Kidde Standard Paks are the same as those used in Kidde custom-designed installations. The difference is that Kidde has pre-engineered the Paks for small hazards. And the savings on volume distribution are passed on to you!

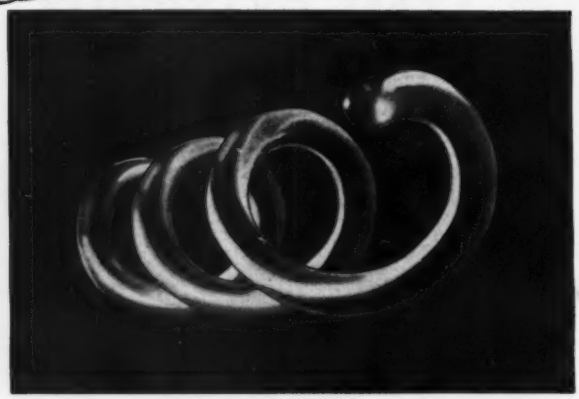
You just can't beat Kidde Standard Paks for inexpensive night-and-day protection against normal flammable liquid hazards.

Remember, fire won't wait till you're ready. Better write today for full information.

Kidde

Walter Kidde & Company, Inc.
630 Main St., Belleville 9, N. J.
Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.





Preformed Armor Rods are UNIFORM

● All Preformed Armor Rods for a given size of conductor are identical. Every pitch is exactly the same. THIS UNIFORMITY, obtained only by "factory-forming" the rods in precision dies with automatic machines, assures the UNIFORMITY of every Preformed Armor Rod assembly. Such inherent UNIFORMITY is maintained, not deformed, during installation or during operation.

PLP UNIFORMITY assures full efficiency of the armor regardless of the size of the conductor, ease of access to the application point, and the skill of the lineman installing it. With Preformed ARMOR rods, no special tools or wrenches are required. Easily installed by hand or hot-line tools, their field service performance can be predicted accurately.

Because the *gripping* action of Preformed Armor Rods is "built-in", they require no end-clamps; they are engineered to retain their initial intimate contact with the conductor throughout their service life . . . nothing to loosen.

For complete details of their exclusive advantages, write or telephone Cleveland: EXpress 1-3571.

PREFORMED ARMOR RODS:

1—Are "factory-formed" to the individual conductor.
2—Reduce substantially installation time.
3—Increase the effective rigidity of the conductor.
4—Minimize fatigue at suspension clamps . . . lengthen conductor life.
5—Have predictable field service performance.
6—Increase conductance of conductor.
7—Are reusable.

PREFORMED LINE PRODUCTS COMPANY

5349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO

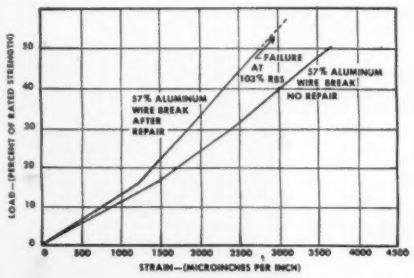
HOW Preformed Armor Rods LENGTHEN CONDUCTOR LIFE

★ The most vulnerable spot of a transmission line is under the suspension clamp. You can get no better armor protection than Preformed Armor Rods. They are always *uniform*—always do the same perfect job—factory engineered and factory formed—no variation in installation. Their intimate contact with the conductor provides the necessary reinforcement without any of the rub or chafe between rods and conductor, which you might expect in a looser installation. Furthermore, they will never loosen. They are not dependent on tightening of bolts which might crush the conductor if improperly applied—and which may become loose.

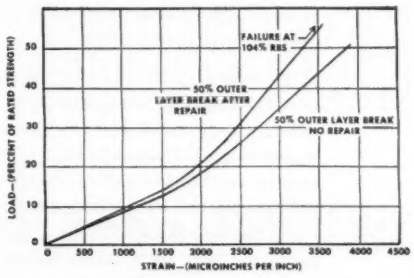
But this is only part of the story: While Preformed Armor Rods will provide the *best* and *safest* protection, they have another *unique* function—they do a job which only Preformed Rods can do. Regardless of armor efficiency, some vibration damage may occur. Should a strand failure occur at the suspension point, Preformed Rods will automatically take on the load, restoring strength and conductance—thereby continuing and lengthening conductor life.*

After all, your interest is in maintaining service—in continued functioning of your transmission lines. You need no longer consider the life of your conductor jeopardized by a strand failure. Preformed engineering has seen to this.

* Many have encountered vibration, chafing and burning failures on unarmored conductors and have used Preformed Armor for repairing and restoration of conductors at those points.


LOAD—(PERCENT OF RATED STRENGTH)
STRAIN—(MICROINCHES PER INCH)
FAILURE AT 103% RBS
57% ALUMINUM WIRE BREAK AFTER REPAIR
57% ALUMINUM WIRE BREAK NO REPAIR

Strength restoration of No. 4, 7 x 1 ACSR (rated breaking strength—2288 lbs.) by Preformed Armor Rods.


LOAD—(PERCENT OF RATED STRENGTH)
STRAIN—(MICROINCHES PER INCH)
FAILURE AT 104% RBS
50% OUTER LAYER BREAK AFTER REPAIR
50% OUTER LAYER BREAK NO REPAIR

Strength restoration of 795 MCM, 26x7 ACSR (rated breaking strength—31,200 lbs.) by Preformed Armor Rods.

These two charts tell the story. Irrespective of conductor size and construction, the clamping characteristics of PREFORMED Armor Rods result in restoration of the strength of damaged conductors to within at least 5 per cent of the rated breaking strength of the original conductors. And remember . . . only with PREFORMED Armor Rods . . . can laboratory tests accurately predict field service performance. There are no "average" installations.

SALES REPRESENTATIVES:

C. S. Anderson Co., *Tulsa* • Bergstrom-Verberg Co., *Minneapolis* • Vincent J. Brown Co., *Buffalo* • Burns Electric Co., *Pittsburgh* • Earl S. Condon Co., *Los Angeles* • Cory and Crum, *Indianapolis* • The Electrical Distributors Co., *Philadelphia* • Engineer Sales Co., *St. Petersburg* JSG Electric Co., *Chicago* • E. L. Flowers, *Boston* • George R. Horne & Co., *Dearborn* • Johnson Sales Co., *Bay City* • H. L. Macon & Co., *Atlanta*, Peterson Co., *Denver* • Elgin B. Robertson, Inc., *Dallas* • Elgin B. Robertson Co., *Houston* • K. M. Ryals Co., *San Francisco* • Shaffer and Nelson, *Portland, Seattle, Spokane* • M. H. Snyder & Sons, *New York* • Curtis H. Stout, *Little Rock, Memphis, New Orleans* • L. H. Wendegatz, *Kansas City*

Sometimes

"Who Says So?"

is Mighty Important!

PLANNING and engineering fire protection—especially for those key hazards where fire can hit like lightning and with crippling effect—is a job for experienced specialists only. Knowing "who says so" and his qualifications may save you from huge loss.

Fire protection by low pressure carbon dioxide is no exception. And here CARDOX' experience is literally years ahead!

With thousands of installations, *plus* years of creative research concentrated by war and high priority projects—CARDOX' knowledge in the engineering and manufacture of low pressure carbon dioxide fire extinguishing systems is unparalleled. Protecting many of the world's toughest hazards, CARDOX Systems* have saved industry from uncountable losses in dollars and production.

A survey of your hazards by CARDOX puts this experience at your service. It can be of great value to you—and it costs you nothing. Why not write for a CARDOX *survey* now?

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CARDOX

ORIGINATOR OF **LOW PRESSURE CO_2**

FIRE EXTINGUISHING SYSTEMS

CARDOX CORPORATION • BELL BUILDING • CHICAGO 1, ILLINOIS

Offices in Principal Cities

Reusable Gaskets

(*Continued from page* 140)

hopper at one end, moved to the other end by a gear-driven worm, and extruded through a die with a rectangular opening. Dies are removable so that various size gasket cross sections can be extruded.

Gaskets are applied and cut to desired length when transformer covers are installed. When transformer covers are removed again the plastic gasketing material is removed and returned for processing again. No difficulty with oil absorption has been experienced.

Electric Floor Heating Protects Gas Meters

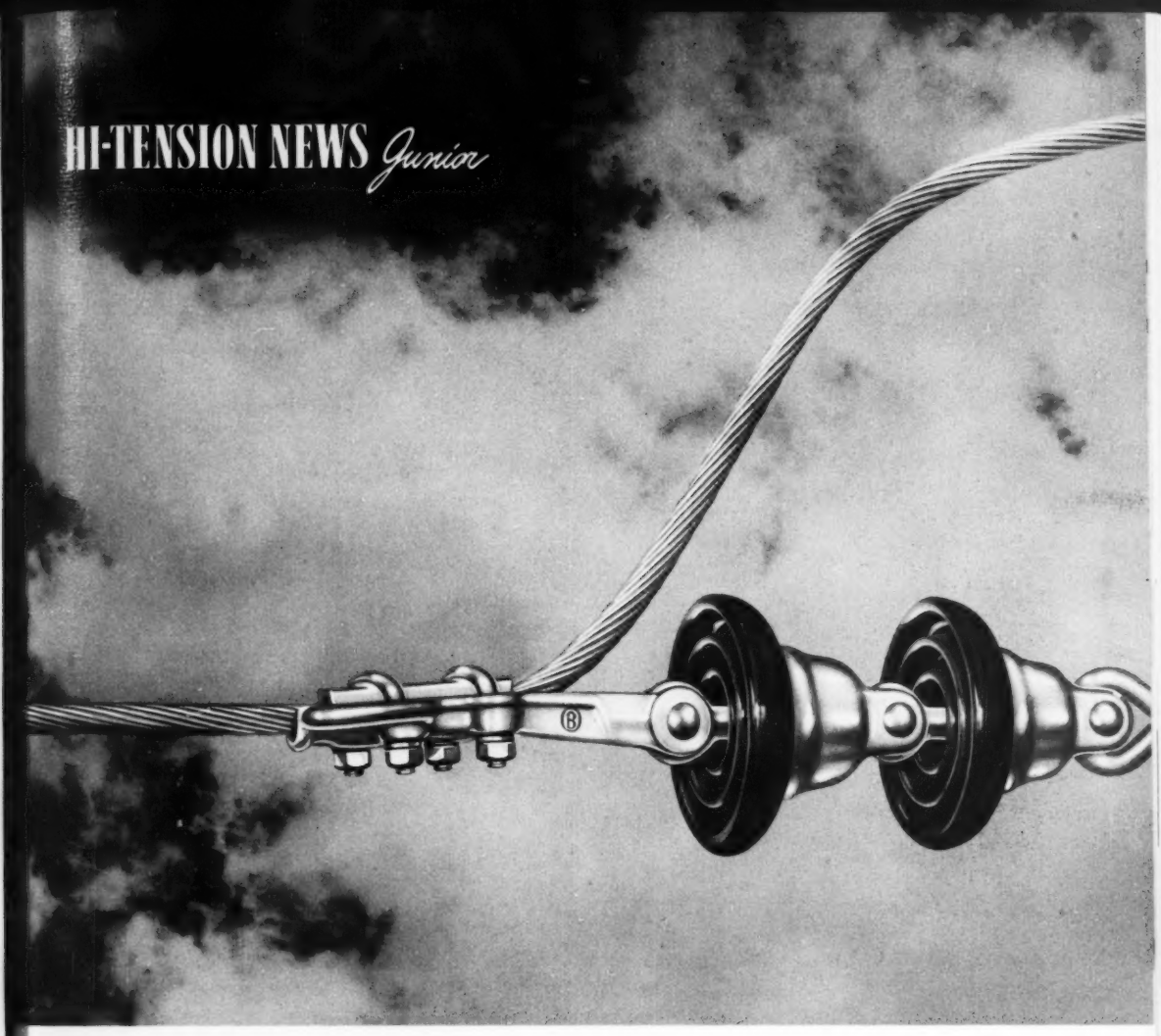
G. K. SAUERWEIN, Mechanical Engineer, NEGEA Service Corporation, Cambridge, Mass.

Floor-installed electric heating wire loops safeguard an installation of 25 100-light gas meters from low temperatures. They provide explosion-proof meter heating at a Federal housing project for 300 low-income families at New Bedford, Mass.

The duplex frame houses are gas-

(*Continued on page* 149)

HEATING WIRES are installed between pouring of main floor slabs and finish pouring. Connections were made to meter and control cabinet on outside of building for protection against explosion.



Is this what you've been looking for?

— a Good Deadend Clamp for Large Diameter Aluminum Primaries

Maybe you have been faced with this problem, too. You want to use one of the larger aluminum or ACSR conductors for a primary distribution line, but are forced to take a poor compromise in picking deadend clamps.

Look over the modernized O-B Strateline clamp design. It's based on a well-tried model -- it is no experiment! It covers the full range of primary conductor sections, with capacity to spare, in only five basic sizes. It is slim, to provide maximum clearance and easy application of protectors for hot line work. It has a safety factor of three or better for holding strength, but does not demand a premium price for clamping power you'll never use.

Several engineers have told us the Strateline is just the distribution clamp they have been looking for. It may also fit into some of your requirements.

Ohio Brass

MANSFIELD, OHIO, U.S.A.

HI-TENSION NEWS *Junior*

Successive views of building a continuous-cable jumper loop with Hi-Lite strain clamps. Above, the lineman is positioning the clamp at a measured point on the finally-sagged conductor cable.

This may suggest a better high voltage clamping practice

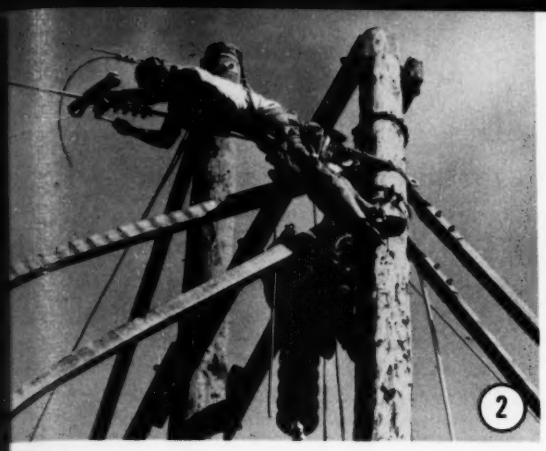
You Can Build Jumper Loops Without Splices—and Do it Faster and Cheaper

With Hi-Lite clamps, the only conductor splices on a transmission line are at the ends of reels. Jumper loops are formed in the continuous cable. Jumper connectors, once a source of serious line troubles, are eliminated.

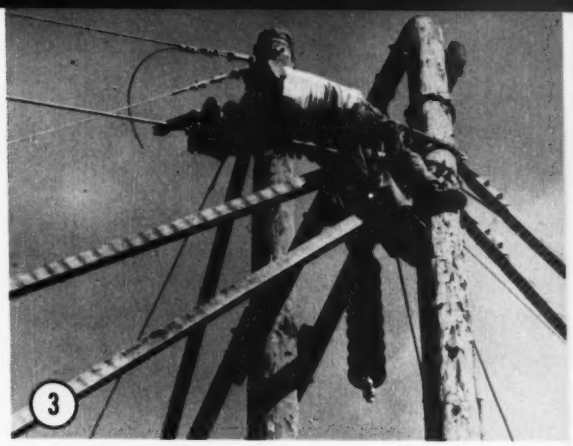
Field installation equipment for the Hi-Lite clamp consists of an ordinary socket wrench -- nothing more. Conductor need not be brought to the ground to make up deadends. Attachment and tightning the clamp is a matter of a minute or two. Idle time of equipment and crews while deadends are being made up is practically eliminated. All these savings are added to the inherent low cost of the clamp. Stringing progresses at better speed.

Hi-Lite clamps in the non-magnetic Cooline group usually conserve enough power in the life of the ordinary line to repay their entire cost many times -- making the conserved power available for sale at a normal profit.

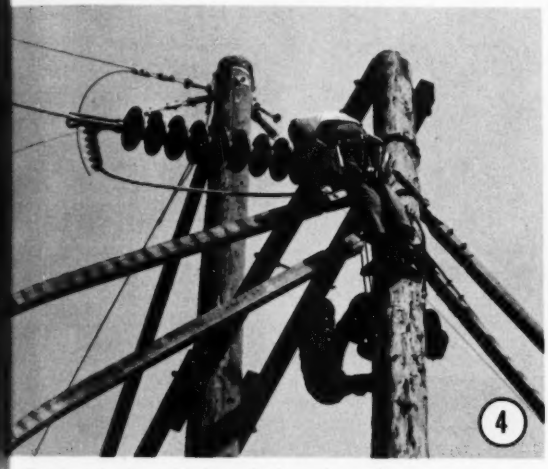
Your O-B representative will be glad to review the general subject of clamping practices. It may open the way to some easily-figured economies.



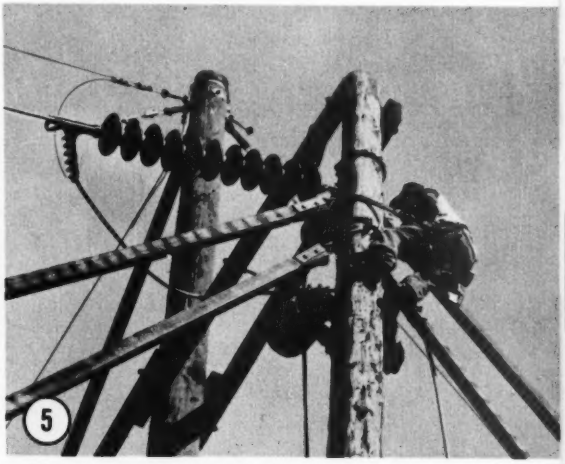
When located at the proper distance from its anchor point, the clamp is finally tightened onto the conductor.



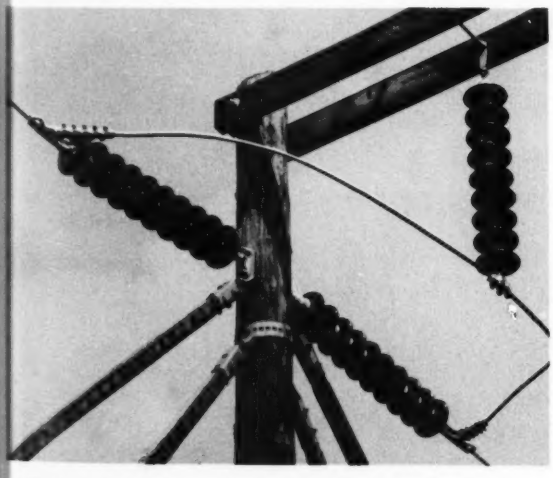
Several more inches of slack are taken in by the winch to make possible attachment of the insulator to clamp.



Tension is let off the winch and conductor strain causes the clamp to rotate into its normal position.



The slack conductor behind the deadend is then available for making up into a continuous-cable jumper.



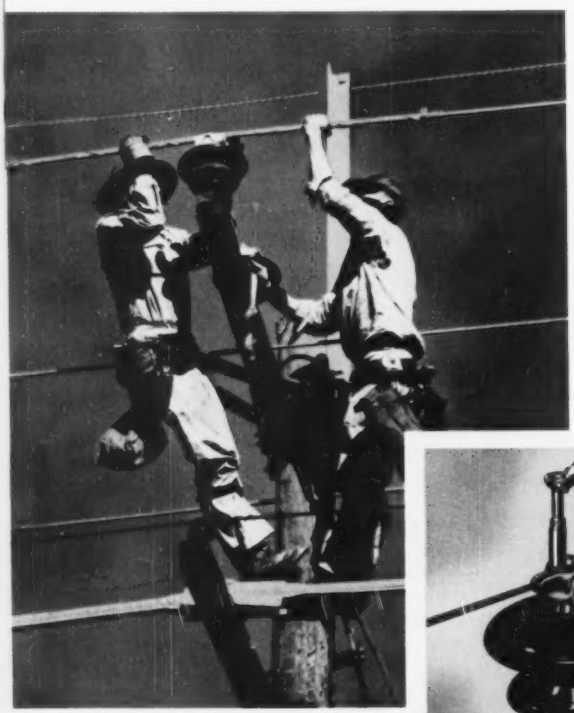
Typical continuous-cable jumper loop that offers no avoidable resistance to the flow of power, and reduces line splices only to those at the ends of reels.

Ohio Brass

MANSFIELD, OHIO, U.S.A.

HI-TENSION NEWS *Junior*

Hurricane exposure on this section of line demands special strength in conductor attachments -- a matter of routine with Clamptops. In less exacting service, the Clamptop prevents conductor chafing by maintaining a tight, slipless grip on the conductor at the insulator head.



In ordinary construction work, men make fast time "tieing-in" Clamptops. A few turns of a hex nut with a hand wrench completes the job -- stronger and more permanent than a tie wire.

How to speed up construction work—yet make it much safer

Clamptop Principle Does Away With Troublesome, Dangerous Tie Wire Installations

Next time you see a hot line crew change a pintype insulator, try this: First, time the job. Second, when the new tie wire is being wrapped, notice the large zone of line potential described by the moving end of that tie. If the hot stick slips, observe the tendency of the tie wire to spring out of control and, remember, the flying end of this tie carries line potential.

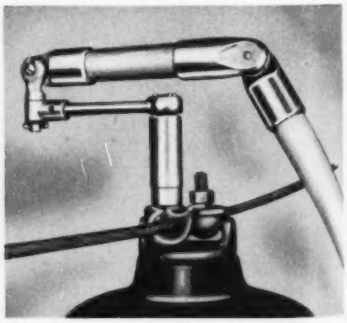
Now, make a comparison. A crew, with simple standard hot line tools, can make a conductor attachment on a Clamptop insulator in about two minutes -- or less with practice. The entire zone of line potential is about the size of a man's fist, and is stationary. A slip of the hot tool merely disconnects that tool from voltage. There is no large, indefinite moving zone around the insulator where line voltage can accidentally exist.

Conclusion: The job is much faster and, as for safety, there is scarcely any comparison. Furthermore, whether applied "hot" or "cold", the Clamptop produces a permanent conductor attachment that won't work loose by strains or vibration, and is stronger than the best tie.

If for no other reason, as part of your general information on insulator developments, you should have first-hand acquaintance with the modern O-B Clamptop principle. . . . And if your experience is typical, once it is tried it will be on your system permanently.

Ohio Brass

MANSFIELD, OHIO, U.S.A.



Leading manufacturers of hot line tools make various designs of wrenches excellently adapted to the installation of Clamptop insulators. With these tools, work progresses almost as fast as by hand. Safety of the operation is obvious to anyone watching a Clamptop installation.

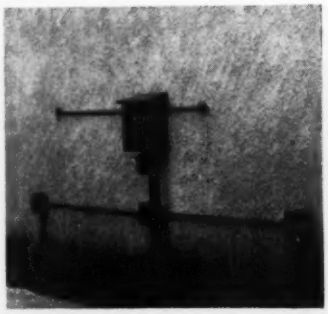
Electric Floor Heating

(*Continued from page* 144)

heated by the New Bedford Gas & Edison Light Co from a 12-in. low-pressure main. Unattended meter house for the project is flat-roofed, 25 x 12 x 11 ft, and built of 8-in. concrete blocks, with a door at one end and a window at the other. Its floor is a 6-in. concrete slab over 6 in. of cinder fill, with wire mesh reinforcement and the roof is 6-in. precast planking with tar and gravel surface.

A problem, which arose in design, was the supply of heat to keep the indoor temperature from falling below 45F. First proposal was to install four 3-kw convection heaters, two on the front wall and two on the rear, with thermostatic control. This, however, was difficult to make explosion proof. Therefore, it decided to install 14 sets of 230-v, 800-w, 80-ft long heating wire loops embedded ¾ in. below the surface in the concrete floor slab, between pouring of main slab and the finish pouring.

Loop terminals are brought through the wall to an outside metal cabinet



CONTROL EQUIPMENT on outside of gas meter house. Magnetic motor starter switch in box at top is controlled by a thermostat inside the building. Terminal boxes below are for making heating loop connections

that houses an ordinary motor control starting switch and a relay actuated by a thermostat inside the building. Because the ground temperature does not fall below 50F there is little heat loss to earth.

The heating equipment is explosion-proof and occupies no floor or wall space, thus providing a convenient and economical arrangement. It has functioned very satisfactorily and consumed 8,500 kwhr during the 1952-1953 heating season.

SHAWMUT'S NEW FORM 208 Amp-trap®

SAVES BOTH CIRCUIT AND CUSTOMER
(FOR 120/208 VOLT AC OR 125/250 VOLT DC NETWORKS)

POSITIVE PROTECTION AGAINST SUPERCURRENTS

Low voltage AC and DC networks give large utilities and their customers greater continuity of service and easy expansion of their systems. The only drawback to this type of network is the constant threat of danger from heavy short-circuit or fault currents. Shawmut's new FORM 208 Amp-trap eliminates this danger from these circuits. On actual test, its amazingly fast "chop-off" stops a short-circuit *even before it reaches the peak of its first ¼ cycle — even if the available peak current could reach* 560,000 *Amps!* It anticipates and prevents the destructive build-up of heavy fault currents so dangerous to office buildings, stores, hospitals, theatres, schools, etc. FORM 208 saves *both* circuit and customers.

USES & SPECIFICATIONS

Amp-trap FORM 208 is made for Entrance Switch Service, Underground Network Conductors, Distribution & Panelboards and other applications. It is built in Ampere ratings of 1000, 1200, 1600, 2000, 2500, 3000, 4000 and 5000 for Entrance Switch Service and for cable sizes from 4/0 to 1000 MCM. It runs "cool" and carries 100% of its rating with temperature rises less than those recommended in the Underwriters' Laboratories Standards for Fuses. The watt (power) loss is probably lower than for *any other over-current protective device.* Hence it may safely be installed in vaults and steel enclosures and subjected to long continued loads.

LOW IN COST — EASY TO INSTALL

FORM 208 Amp-traps clear fault currents long before they can burn or wreck bus bars and switch gear. Yet they are small in size, low in cost and easy to apply. They have a variety of mountings for flat, bus or tubular connectors. Adapters can be supplied for switch cubicles now equipped with copper or aluminum alloy links. FORM 208 is the "little brother" of the famous FORM 600 Amp-trap which has long been used so successfully on 600 volt circuits. Write today and find out about FORM 208 at once.

208
WITH TUBULAR TERMINALS

Copyright 1953 The Chase-Shawmut Co.

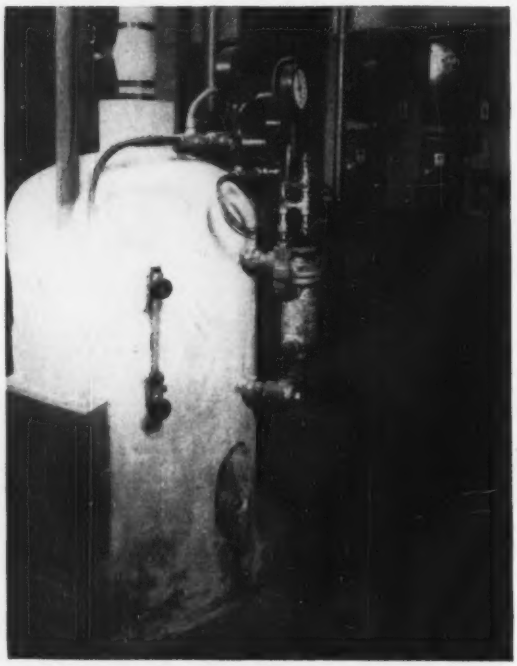
OUR 60 YEAR — FROM EDISON TO ELECTRONICS

208 AMP-TRAP — "Awake At The Switch"

THE CHASE-SHAWMUT CO.

370 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS

INDUSTRIAL APPLICATIONS



Electric Steam Boiler Saves $6,500 Annually

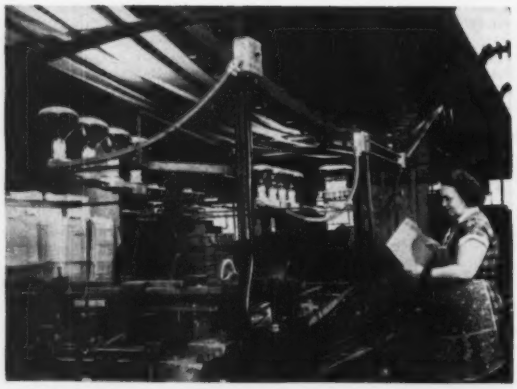
W. H. DuBOIS, Power Engineer, Narragansett Electric Co, Providence, R. I.

A 60-kw electric steam boiler installed, in May 1951 at the Lloyd Products Co, Providence, R. I., has saved about $6,500 per year in operating costs over the formerly used oil-fired boiler. The steam boiler provides flexibility in steam source and avoids operating the high pressure oil-fired boiler on a three shift basis.

The platens of six automatic plastic molding presses and several manually-operated presses are heated with the electrically generated steam which has made possible increased production schedules.

The six boiler hp electric steam boiler has openings to allow an increase to eight boiler hp with the addition of one more contractor. This will increase the connected load from the present 60 kw to 80 kw. Present monthly consumption of the boiler is approximately 20,000 kwhr.

STEAM BOILER (6 boiler hp) replaced formerly used high pressure oil-fired boiler for supplying steam to six plastic molding presses saving about $550 per month operating costs and increased production



FRINGE HEAT is minimized with infrared drying of envelope sealing gum. Operators stay cooler, feel better, work more efficiently with less fatigue. Open-end machine turns out 100,000 catalog envelopes daily

ROTARY MACHINE dries sealing gum on short-run or over-size envelopes. Dryer-conveyor carries envelopes around infrared wheel. Envelopes are then boxed and made ready for shipment

Infrared Dries Sealing Gum In Seconds

A tough problem with residual heat has been solved with infrared lamps at the Standard Envelope Mfg. Co., Cleveland, Ohio. The remoistening glue applied to the sealing flaps of envelopes is dried in seconds.

V. H. BERWICK, Industrial Sales Engineer, Cleveland Electric Illuminating Co, Cleveland, Ohio

C. A. Aaron, assistant to the president, says "Infrared gives us better working conditions. Because infrared heat is fumeless, the work area is cooler, cleaner. Because there is less fringe heat with infrared drying, the operators work more comfortably and efficiently with less fatigue. The ma-

The WHO...

WHAT...

WHY...

WHEN...

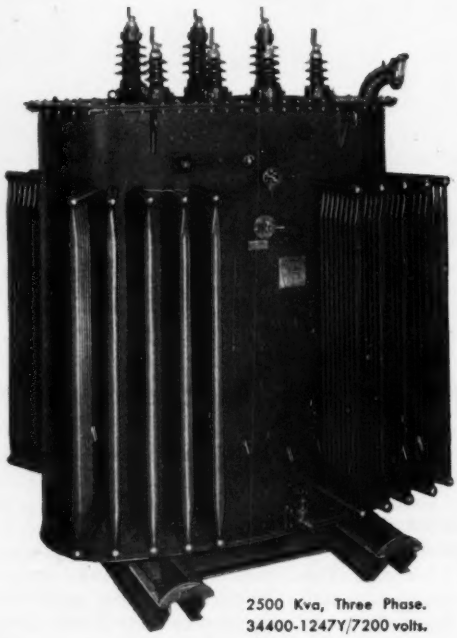
and WHERE

on how you can

Save up to 8%

by specifying

PENNSYLVANIA STANDARD PARTS POWER TRANSFORMERS



2500 Kva, Three Phase.
34400-1247Y/7200 volts.

who Can Use Pennsylvania Standard Parts Power Transformers?

Practically all utilities and industrials can use Pennsylvania Standard Parts Power Transformers because the electrical ratings and accessories are in accordance with NEMA Standards and proposed ASA-Standards C57.12a. To meet a wider range of system requirements, variations are permitted both in accessories and in electrical characteristics.

what Are Pennsylvania Standard Parts Power Transformers?

They are single or three phase Power Transformers, now manufactured in sizes up to 10,000 Kva and up to 69 Kv. Transformers are "Standard" when they conform to standard voltage ratings and are equipped with standard accessories in standard locations. For such transformers a full discount of up to 8% is applied. When voltages are other than standard, but within a certain voltage rating, slightly lower discounts are applied.

why Do Standard Parts Power Transformers Sell for Less?

Because quantity production methods of manufacturing, coupled with the use of standard designs and standard parts, shorten engineering and production time which, in turn, reduces the price of the transformer by as much as 8%.

when Can Deliveries Be Made on Standard Parts Power Transformers?

As a rule, deliveries of Standard Parts Power Transformers will be at least six to eight weeks faster than deliveries of special transformers. In some sizes, however, deliveries may be made even sooner.

where Can More Information on Standard Parts Power Transformers Be Obtained?

By contacting the Pennsylvania Transformer Representative in your area or by writing to Pennsylvania Transformer Company, Box 330, Canonsburg, Pa.

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division

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equipment you can rely on

Talk to any old-timer on the job and he'll tell you Klein equipment is his choice for comfort—for safety—for service. Look for the familiar Klein trade-mark on pliers, safety straps and belts, climbers, grips and wrenches. Klein has been serving the electrical industry "Since 1857."

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chines stay cleaner too and require less care. Our people appreciate the safety of infrared lamps."

"It's often necessary to turn off the machine quickly when the paper 'jams up' as it's going through. With infrared, the second the machine stops, the lamps go out, the heat dissipates, and there is no left-over heat to cause the paper in the machine to wrinkle or curl."

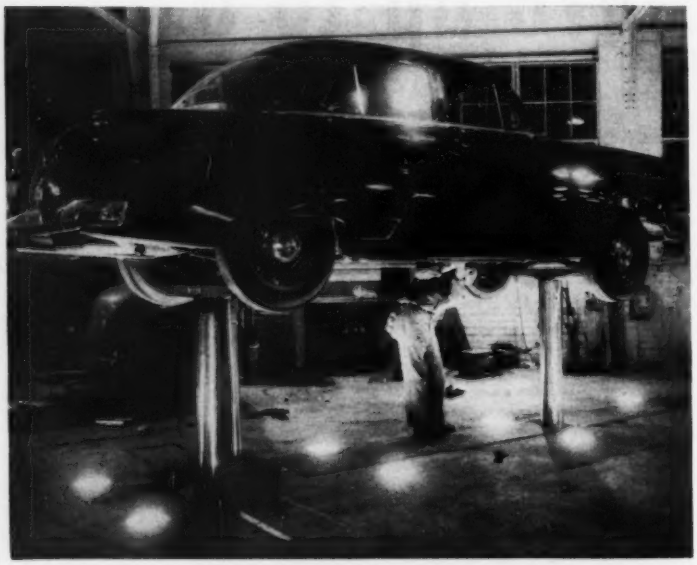
There are several sets of lamps in each rotary machine. The number of lamps to be used depends upon the type and amount of glue being applied, the humidity in the air, the weight and quality of paper, and the speed of operation.

Stacks of die-cut paper are automatically fed into each machine. Wet sealing gum is applied along the edge of the top flap. With only the wet edge exposed to the drying rays, each sheet of paper passes through a bright tunnel of infrared lamps. It takes about six to eight seconds for a single sheet to move under one set of infrared lamps.

The side and bottom flaps are then automatically folded in and pasted in place. As the finished envelopes slide off the electric conveyor, the operator boxes them for shipment.

This same operational sequence transforms a large sheet of heavy die-cut paper into a catalog-size envelope. The relatively thick remoistening glue applied to the sealing flaps of these envelopes is quickly dried by infrared lamps.

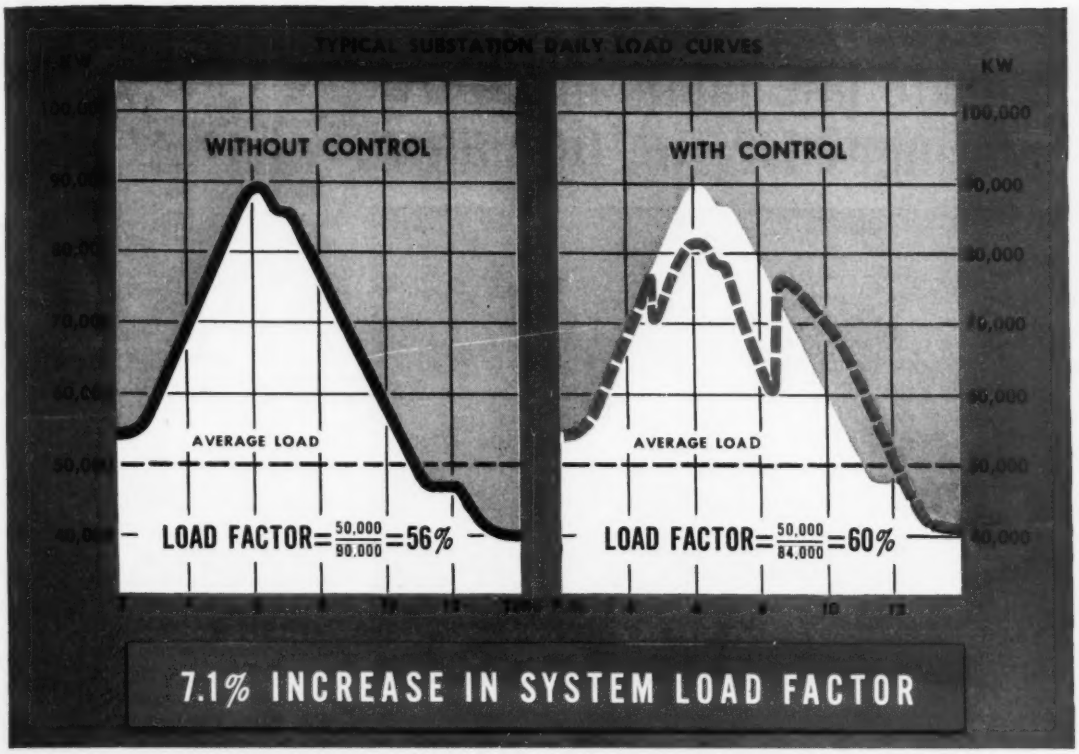
A conveyorized wheel-shaped infrared dryer is also used in applying glue and drying it on certain short-run or over-size envelopes.



FLUSH LIGHTS, mounted in floor of garage, solved problem of lighting for under side of cars. The eight units used are impact resisting glass flush mounted in two rows in concrete floor at 5 ft 4 in. intervals. Rows are spaced 3 ft apart. Lamps are 100 w to provide even lighting with brightness level that is not too high. Units will accommodate 150 w lamps

Floor Lighting Speeds Mechanic's Work

Toledo Edison has solved the problem of lighting under cars that are being serviced by installing eight lights mounted flush with the floor. The arrangement provides plenty of good light wherever it is needed. This is in contrast with the old drop cord which usually has the light in the wrong place, frequently in the mechanic's eyes. The new lighting has been a great time saver, too, because the mechanic does not have to move the light each time he changes position. Installation was designed by Martin L. Bettinger, Industrial Lighting Specialist with Toledo Edison.



LOAD FACTOR IS DERIVED FROM THE RATIO OF AVERAGE LOAD TO PEAK LOAD—OFF PEAK CONTROL DIRECTLY EFFECTS L. F. INCREASE.

Increasing Your System Load Factor— An Important By-product of Off-peak Control

A controlled electric water heating load increases considerably the load factor of most systems—here are the facts about an important off-peak control benefit.

Load factor, the ratio of average load to peak load, is a clear indication of the financial yield on a system investment. The more kilowatt hours sold without exceeding a given peak demand, the greater becomes the return on system investment.

A MATTER OF ARITHMETIC

For example: a substation serves 100,000 customers. 10,000 have water heaters and 30,000 have electric ranges. Assume an average load of 50,000 kw and a peak load of 90,000 kw (without control).

$$\text{L.F.} = \frac{50{,}000}{90{,}000} = 56\%$$

If the 10,000 water heaters are controlled from 5-10 P.M. the peak load is reduced by 10,000 x 0.6 kw per heater (the diversified demand for the average water heater today) or 6000 kw. Thus, peak demand is lowered to 84,000 kw. Therefore:

$$\text{New L.F.} = \frac{50{,}000}{84{,}000} = 60\%$$

With off-peak control this represents a 7.1% improvement of the load factor—a substantial increase in the economic efficiency of the system.

TWO TYPES OF CONTROL

The two most popular methods of control are time switch and 720-cycle. Time switch and 720-cycle control are not incompatible on the same system. In some instances the results of the system study indicates that both types should be used for the greatest savings. A system study must be made to evaluate an individual system.

FOR MORE INFORMATION

Call your nearest General Electric Apparatus Sales Office, where a G-E representative will be glad to show you the new color slidefilm "The Economics of Off-peak Control"—and will discuss off-peak control in terms of your own system. Or write for Bulletin GEA-5819 to Section 603-145, General Electric Co., Schenectady 5, N. Y.

GENERAL ELECTRIC

Locate line faults instantly at ranges 1/2 to 200 miles

Model 124 Line Fault Analyzer

Now you can locate power, telephone or telegraph line faults instantly and accurately under all weather conditions. Sierra Model 124 Analyzer eliminates virtually all lost time, hard work and hazard of finding breaks, shorts, opens or other discontinuities. Operating from a powerhouse, transformer bank, substation or terminal point, it pinpoints faults from ½ to 200 miles away with accuracy of ±1 mile on the 200 mile range.

The Analyzer operates on radar techniques, sending a high amplitude pulse along a conductor and presenting echoes from discontinuities as pips on a radar-type "A" scope. Operation is extremely simple, and distances are read direct in miles. Calibrated sweep ranges of 5, 25, 50 and 100 miles are provided. A sweep delay extends range to 200 miles, or permits line segments as small as five miles to be presented full-screen. A movable distance marker can be ranged from 5 to 100 miles.

Model 124 weighs just 59 pounds; and is completely contained in a weatherproofed carrying case. ***Price $795.00 f.o.b. factory.***

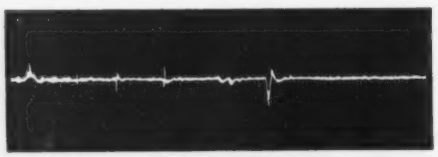


Figure 1

Test on 60 kv line, instrument on 100-mile sweep. Negative pip to right of center indicates line grounded at 60 miles. Other pips are switchyards, transformer bank, substation tap, carrier coupling capacitor, change in line configuration.

For complete details, see your Sierra sales representative or write direct for Bulletin 102B

sierra

Sierra Electronic Corporation
San Carlos, California, U.S.A.
Sales representatives in major cities

Manufacturers of Carrier Frequency Voltmeters, Wave Analyzers, Directional Couplers, Wide-Band RF Transformers, Custom Radio Transmitters.

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2768

INDUSTRIAL BRIEFS

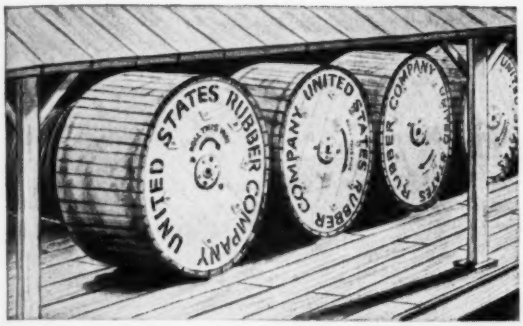
Preset speed control within plus or minus 1% between 75 and 974 rpm is obtained for a calendering machine with a 50-hp motor variable speed drive in U. S. Rubber Co's footwear division. Electronic tube control keynotes installation. Controls provide also for starting, stopping, jogging forward or reverse, with dynamic braking for quick stops. Electronic controls multiply effectiveness of skilled workers and increase production. Connecticut Light & Power Co.

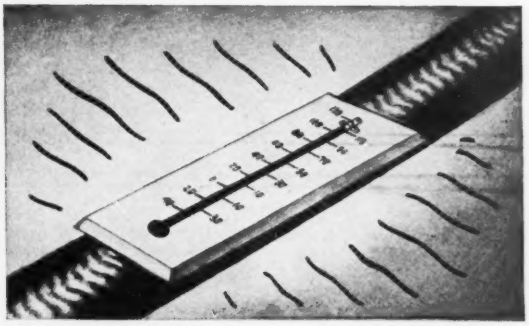
Heating platen with strip heaters at Scio Cabinet Co, Scio, O., provides better product in 30 min than previously-used method which required 16 to 24-hr drying time. Fifteen kw of thermostatically controlled strip heaters clamped to 4-ft x 10-ft platen of hydraulic press provide enough heat to set thermal setting adhesive used to apply Formica to plywood backing. R. W. Hunt, Commercial Sales Rep, Ohio Power Co, Dennison, O.

Electronic control cut labor force of C. H. Norton Co, No. Westchester, Conn., from 45 to 27 men for same tonnage in producing paper board ranging in thickness from 0.045 to 0.125 in., and in sizes from 102 to 125 in. Photoelectric tubes govern relay operations in sequence. Functions include prevention of skidding in stopping material in exact cutting position, deceleration of conveyor speeds from 100 to 2.5 ft per min, automatic selection of loaders according to available level, and acceleration to 100 ft per min after oven drying. Originally all cutting and delivery operations were by hand. Connecticut Light & Power Co.

Protective lighting at Buckhill Concrete Products Co, Canton, O. has eliminated intrusions and stealing in the material storage area, and provided sufficient light for early and late operations during winter months. Considerable advertising value has also been obtained. Time clock control is provided for three 750-w floodlights mounted on top a cement storage bin. Lights burn an average of 12 hr nightly. G. W. Craiglow, Ind Power Engr, Ohio Power Co, Canton, O.

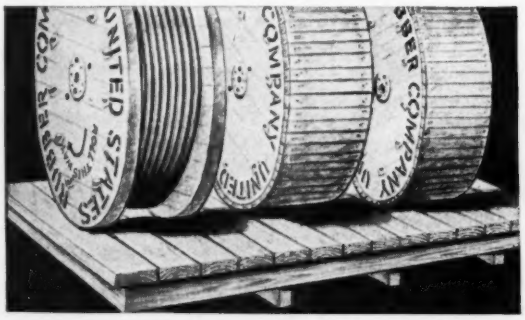
How to prolong the life of wire and cable by proper storage

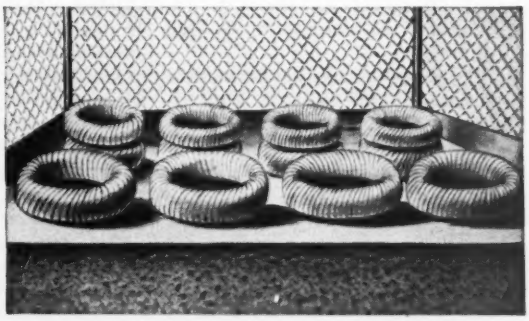




1 **Protect cables from the weather.** Moisture is especially injurious to fibrous coverings. When stored out-of-doors, if they become wet and then freeze, they will be weakened and the saturant will flake off. In humid weather, mold growth is accelerated, weakening the covering and making it easier to damage the cable during installation. (Rubber and thermoplastic insulated and jacketed cables may be stored under moderately humid conditions.) The larger sizes of fibrous covered and rubber jacketed cables and all lead-sheathed rubber insulated cables must be stored on reels which must be properly lagged—or the cable must be otherwise suitably protected against mechanical damage. Reels can be stored out-of-doors if the cable is protected against sun and weather, and the ends are properly sealed.

2 **Don't expose wires and cables to extremes of temperature.** Chemical reactions occur at a higher rate at high temperatures than low. The greatest deterioration of low-voltage cables is due to chemical changes, oxidation or internal changes in the compound itself. Never store reels in the boiler room unless you use a fan to blow hot air away from the wires and cables. It's best to store cables at room temperatures indoors out of direct sunlight. Rubber insulated cables may be stored and handled without damage at the lowest temperatures ordinarily encountered, but thermoplastic synthetic insulated cables should not be handled at temperatures below –10 C. (14 F.)





3 **Reels should be kept off the ground,** so that moisture will not harm the cables, reel flanges and lagging. Sound reels are easier to handle and there is less chance of injury to the cable as it is removed from the reel.

4 **Coils should be stored one layer deep on the floor or shelves,** with the axis either horizontal or vertical. To save space, they may be stacked, but not more than 5 coils in height—otherwise there is harmful pressure on the insulation. Don't remove brown paper or box that protects against dust and light until used.

5 **Rubber insulated fibrous covered, rubber jacketed or lead-sheathed cables in storage** should never be bent to a diameter less than I.P.C.E.A. recommended diameters. Never let coils or reels drop more than a few inches. Always roll a reel in the direction indicated by the arrow on the flange. When rolling an unlagged reel, put planks under the flanges to avoid pressure on the cable. Coils, reels and spools should always be rotated when wire and cable is removed to avoid twisting the cable.

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UNITED STATES RUBBER COMPANY

U.S.RUBBER
...RVING THROUGH SCIENCE

Electrical Wire and Cable Department

ROCKEFELLER CENTER • NEW YORK 20, NEW YORK

CRICKET RAISER J. C. Watkins lifts a can of new fish bait from one of his electric brooders

South Hot for Cricket Brooding

Cricket production is mushrooming into the newest big business in the Southland and especially in the state of Georgia.

Demand for crickets as fish bait has increased to such an extent there that regular hatcheries have been established. And the best way to obtain good production records is with an electric brooder.

Capitalizing on this fact, Georgia Power Co recently printed 2,000 pamphlets on cricket brooding for distribution among rural customers. A second printing had to be made within ten days, and now soil conservation agencies have asked for an additional 1,000 copies.

Cricket raising provides a good electric load, which is constant throughout the year, power company officials have found. The load can be deveioped on both rural and city lines because crickets can be raised in boxes in the basement, barn, or a special shed. A female cricket will lay four or five eggs a day for 30 days and in two months they are ready as fish bait. A 90 to 95 deg. F. temperature is needed for the female to lay the eggs and to hatch them.

Several large cricket raising enterprises have already sprung up along Georgia Power lines. One of them is run by J. C. Watkins, a retired mechanical engineer. In a 10 by 20 ft shed he has stacked a dozen cricket brooders in racks, to which he expects to add more in the future.

Boxes are of plywood 2x2x6 ft with hinged top, and a glass window through which the crickets can be inspected. Heat is supplied by two 150-w strip heaters with two 40-w bulbs for light. Temperature is controlled by a water-type thermostat.

Electric Appliance Line Expanded by Servel

Servel, Inc, has supplemented its line of household refrigerators, home freezers, portable electric refrigerettes, and water heaters. The new appliances, unveiled at the company's mid-year conference of distributors, include four electric compression refrigerators with pushbutton automatic frosting, an upright home freezer with nearly 22 cu ft of storage space, and deluxe versions of the Wonderbars. Five electric water heaters will also be added shortly.

4-H Expansion . . .

. . . program planned by cooperatives and private companies in Minnesota

Funds for a greatly expanded 4-H Club electrical education program in Minnesota have been subscribed and transferred to the University of Minnesota. Contributors are: Minnesota Electric Cooperative (representing rural electric cooperatives), Interstate Power Company, Minnesota Power and Light Company, Mississippi Valley Public Service Company, Northern States Power Company, and Otter Tail Power Company. North Central Electrical Industries will serve as sponsor.

For a number of years, the electrical education program of the 4-H Club has been confined to areas served by two utilities. The present fund, however, will make it possible to give the program statewide coverage. The monies will be allocated for awards in 91 county agent districts; printing a 4-H Club electrical bulletin; printing project training information and conducting two district pilot projects for training local leaders and county agents.

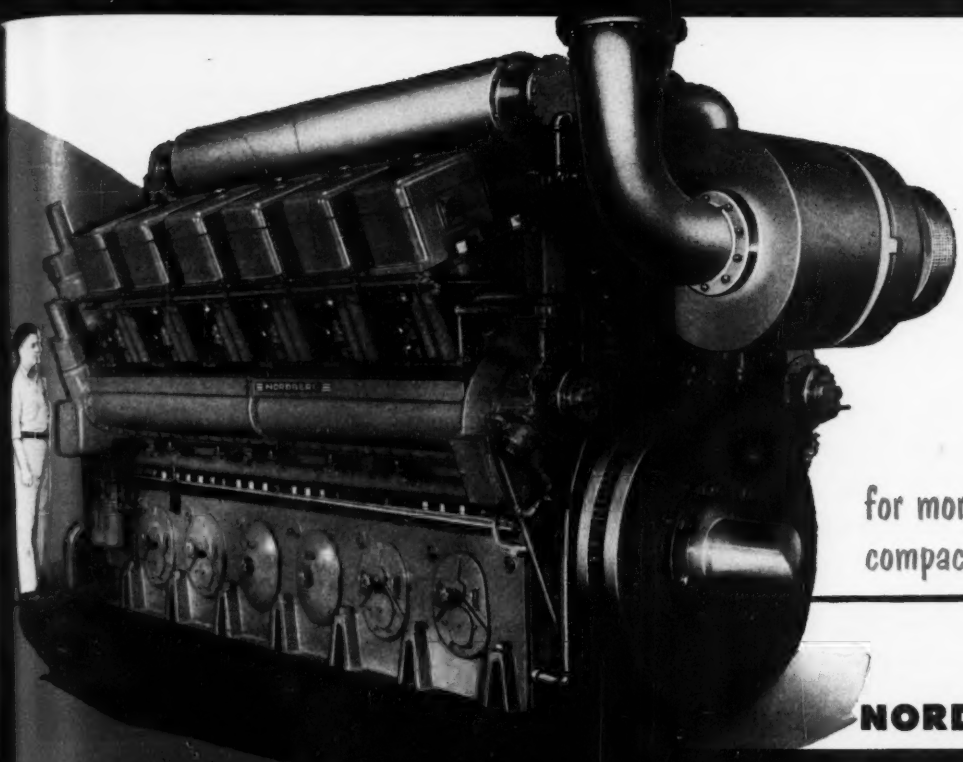
"We are grateful for this generous support to our 4-H Club program", said Leonard Harkness, state 4-H leader. "Our members will be assisting with education so that more effective use of electricity can be made," he added.

Dealers Help Co-op In Range Campaign

Central Rural Electric Cooperative, Stillwater, Okla., has joined with electric range dealers and distributors throughout its service area to give co-op members a bargain during its electric range campaign.

The co-op is giving 100 kwhr a month for one year to any member installing a range during June and July. A free home demonstration by the cooperative's home economist is also included.

Range dealers are giving free normal installations, and reports indicate members are taking advantage of the bargain.



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SUPAIRTHERMAL

FOUR-CYCLE V-TYPE ENGINES

- COMPACT
- HIGH THERMAL EFFICIENCY
- ECONOMICAL
- DEPENDABLE
- RUGGED CONSTRUCTION
- WIDE HORSEPOWER AND SPEED RANGE

. . . another important Nordberg advancement in the design and development of more efficient engines

Here is the Nordberg four-cycle SUPAIRTHERMAL V-Type engine . . . designed and built for continuous low cost operation for a wide range of stationary and marine power applications. This engine is available in 12 or 16 cylinders of 13″ bore in Diesel, Duafuel or Spark-Fired Gas types from 2400 to 4260 hp at 450 to 600 rpm.

The design of this V-Type engine incorporates all tested and proved performance features of Nordberg 13″ bore in-line SUPAIRTHERMAL engines. The high thermal efficiency of the SUPAIRTHERMAL engine is made possible by variable inlet valve timing control . . *an exclusive patented Nordberg feature.*

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NORDBERG

DIESEL • DUAFUEL® AND SPARK-FIRED GAS ENGINES

CRICKET RAISER J. C. Watkins lifts a can of new fish b

South Hot for Crick

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Demand for crickets as fish bait has increased to such an extent there that regular hatcheries have been established. And the best way to obtain good production records is with an electric brooder.

Capitalizing on this fact, Georgia Power Co recently printed 2,000 pamphlets on cricket brooding for distribution among rural customers. A second printing had to be made within ten days, and now soil conservation agencies have asked for an additional 1,000 copies.

Cricket raising provides a good electric load, which is constant throughout the year, power company officials have found. The load can be developed on both rural and city lines because crickets can be raised in boxes in the basement, barn, or a special shed. A female cricket will lay four or five eggs a day for 30 days and in two months they are ready as fish bait. A 90 to 95 deg. F. temperature is needed for the female to lay the eggs and to hatch them.

Several large cricket raising enter-

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Electric Appliance Line Expanded by Servel

Servel, Inc, has supplemented its line of household refrigerators, home freezers, portable electric refrigerettes, and water heaters. The new appliances, unveiled at the company's mid-year conference of distributors, include four electric compression refrigerators with pushbutton automatic frosting, an upright home freezer with nearly 22 cu ft of storage space, and deluxe versions of the Wonderbars. Five electric water heaters will also be added shortly.

4-H Expansion . . .

. . . program planned by cooperatives and private companies in Minnesota

Funds for a greatly expanded 4-H Club electrical education program in Minnesota have been subscribed and transferred to the University of Minnesota. Contributors are: Minnesota Electric Cooperative (representing rural electric cooperatives), Interstate Power Company, Minnesota Power

TIGH

BOU

In Range Campaign

Central Rural Electric Cooperative, Stillwater, Okla., has joined with electric range dealers and distributors throughout its service area to give co-op members a bargain during its electric range campaign.

The co-op is giving 100 kwhr a month for one year to any member installing a range during June and July. A free home demonstration by the cooperative's home economist is also included.

Range dealers are giving free normal installations, and reports indicate members are taking advantage of the bargain.

for more economical
compact power . . .

HTLY

UND

NORDBERG

IRTHERMAL

:YCLE V- TYPE ENGINES

nt Nordberg advancement in the design

more efficient engines

berg four-cycle SUPAIRTHERMAL V-
lesigned and built for continuous low
wide range of stationary and marine
This engine is available in 12 or 16 cyl-
Diesel, Duafuel or Spark-Fired Gas types
from 2400 to 4260 hp at 450 to 600 rpm.

The design of this V-Type engine incorporates all tested and proved performance features of Nordberg 13″ bore in-line SUPAIR-THERMAL engines. The high thermal efficiency of the SUPAIR-THERMAL engine is made possible by variable inlet valve timing control . . *an exclusive patented Nordberg feature.*

*Trademark

NORDBERG MFG. CO., Milwaukee, Wisconsin

Builders of America's largest line of heavy-duty Diesel engines from 10 to over 10,000 horsepower

NORDBERG

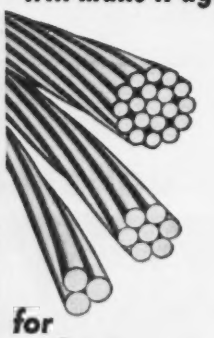
DIESEL • DUAFUEL* AND
SPARK-FIRED GAS ENGINES

an ACCO product

Stainless Steel STRAND

PAGE

will make it again



for

GROUND
GUY
MESSENGER
CATENARY

Higher—

Corrosion resistance
Tensile strength
Elastic limit
Resistance to abrasion
Strength-to-weight ratio

Lower—

Cost per year during use

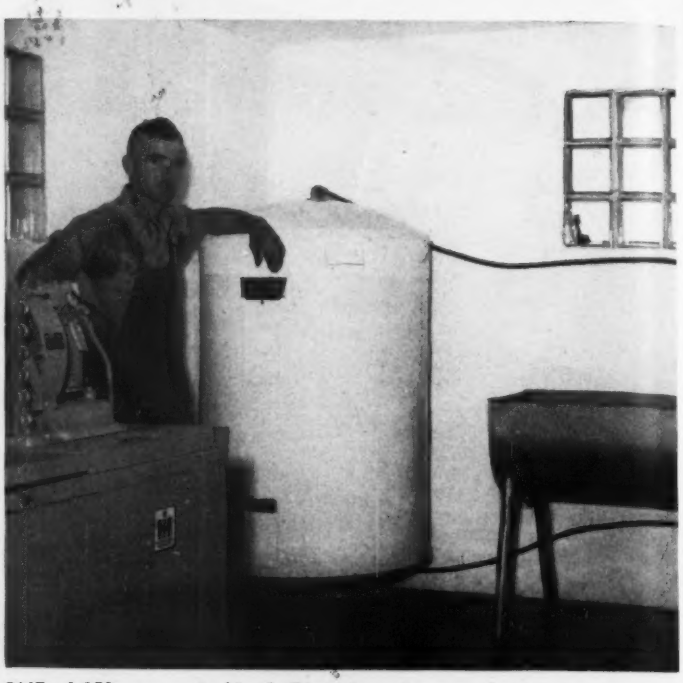
Present restrictions prohibit our furnishing PAGE *Stainless Steel Strand today, but it will pay you to consider it for the future.*

PAGE Strand

ACCO

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Portland, San Francisco, Bridgeport, Conn.



ONE of 250 persons in North Central rural areas who is . . .

Heating with Water Heaters

Wisconsin and Minnesota farmers work with appliance that warms milk houses and egg grading areas—as well as water

By **C. P. WAGNER,** Farm Electric Consultant, North Central Electrical Industries, Minneapolis, Minn.

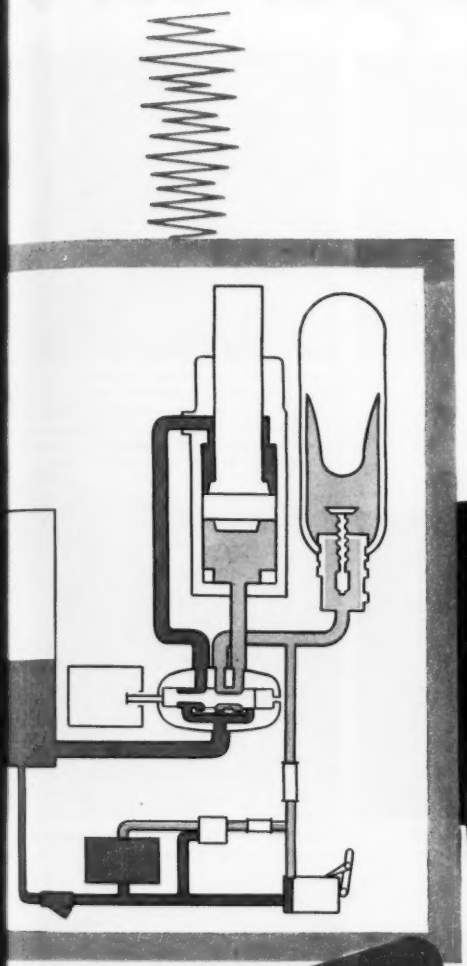
Using water heaters to supply limited space heat, as well as hot water, for farm operations is being carried on experimentally in Minnesota and western Wisconsin. More than 250 of large capacity heaters were installed in a preliminary study during 1952 to heat milk houses, egg grading rooms and other such areas of about 1,000 to 1,500 cu ft. Temperature induced seldom exceeded 40 deg.

One water heater manufacturer simply lifts the top of his heater covering and installs an extension. This permits use of a small motor and fan to circulate air over a complex shell arrangement and then discharging the heated air into the room. About 150 cu ft of air per minute will do the job.

Tank sizes are selected that will allow input of the required energy during the charging hours. Minimum tank size in use is 93 gal, with 2,000-w bottom elements and 3,000-w top elements for 18 to 20 hours charging. Elements are reversed in their position in case of shorter hour operation.

Findings Listed . . . It has been found that about 33 to 40 kwhr are needed for the six coldest days, and to supply 25 gal of hot water at 170 deg. If milk coolers are in use, this is reduced by about 2 kwhr per 10 gal can of milk cooled. This applies for about 1,000 cu ft of insulated space operated to 40 deg. There is 40 deg heating at .6 kwhr per degree day for 1,000 cu ft. There are 2,700 degree days heating per season.

Several electric cooperatives in western Wisconsin are trying 8 to 11 hours night charging with the bottom element of 2,000 w, and about 3 hours of afternoon recharging with a 3,000-w top element when needed.



PROGRESS IN Switchgear

For the first time one circuit breaker operator combines the inherent reliability and simplicity of hydraulic operation with the high speed advantages of pneumatic. The good features of both are combined in a system that utilizes pneumatic energy through a hydraulic drive. It is a system designed to meet present and anticipated high speed reclosing performance, plus:

- Full mechanically trip-free operation for positive circuit interruption under all operating conditions.
- Complete installation and test without control power, because manual pump allows *full speed* or controlled speed closing.
- Simple adjustment! The entire system contains but one adjustment and this is readily accessible.

This new mechanism is available on all Allis-Chalmers circuit breakers from 3,500,000 kva, 115 kv to the largest sizes in service today.

An Allis-Chalmers engineer will be glad to discuss the *Pneu-Draulic* operator with you. Call your nearby A-C district office, or write for Bulletin 71R7914, Allis-Chalmers, Milwaukee 1, Wisconsin.

Pneu-Draulic is an Allis-Chalmers trademark.

NEW CIRCUIT BREAKER OPERATOR

HOW IT WORKS. The high speed of the new operator is obtained by using the energy stored in a pneumatic accumulator tank. The accumulator contains a synthetic bag, charged with gas under pressure. The gas is still further compressed when a liquid is pumped into the accumulator tank from a reservoir by a small motor driven pump included with the operator.

This compressed gas supplies the high speed operating power. The liquid acts as the linkage to transmit the power from the accumulator to the operator closing piston.

Energizing closing circuit operates solenoid control valve to admit high pressure oil to bottom of breaker, closing cylinder. This forces piston upward to close breaker. Spool type valve simultaneously opens passage for return of oil from above piston to reservoir. Piston is returned to lower position when solenoid is de-energized. Spool type valve admits high pressure oil to top of piston and opens passage for return of oil from lower part of cylinder to reservoir.

A-4111

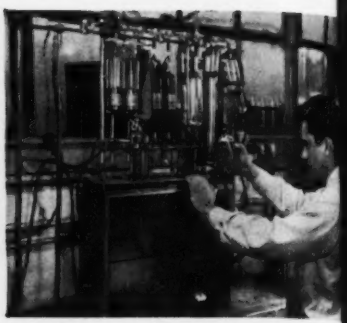
ALLIS-CHALMERS

MOLONEY HiperCore

1. MATERIAL CONTROL

All materials used in the manufacture of HiperCore Distribution Transformers are tested before fabrication to be sure that Moloney specifications have been met.

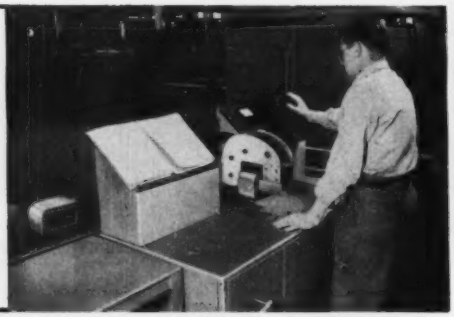
Tests of sample from each roll of oriented silicon core steel are made for flux carrying capacity, exciting current losses, weight, thickness and uniformity of laminations.



A transformer is no better than its oil. Complete tests are made on samples of every tank car received at the Moloney plant. In addition a special tests has been devised by Moloney to guara uniform quality of each shipment of oil. These tes all in addition to tests made at the refinery.

2. PROCESS CONTROL

Each core and each coil is tested separately after being wound and again tested during various stages of assembly to be sure that each is of the high quality required in HiperCore Transformers.



Each HiperCore core is tested after annealing and impregnation for hysteresis and eddy current losses before and after cutting.

Each HiperCore coil is tested for proper ratio of between windings in all tap positions.

3. PRODUCT CONTROL

Every HiperCore Transformer receives complete ASA tests before leaving our factory. Periodic surge tests of transformers taken at random from the production line are also made on our 3,600,000 volt surge generator.

Each assembled core-and-coil unit with necessary tap changers and other internal accessories is tested before being tanked.

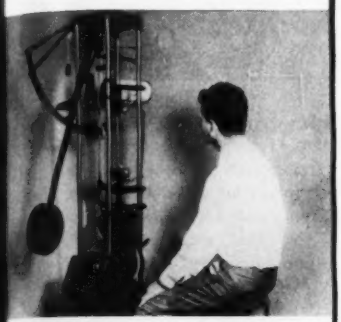
Final HiperCore tests and final ASA Standards T are made on all transformers. Included are loss t exciting current tests, polarity check, ratio check dielectric tests.

MOLONEY ELECTRIC

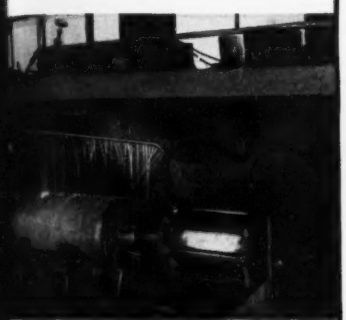
Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control

FACTORIES AT ST. LOUIS 20, MISSOURI AND TORONTO, ONTARIO, CANADA

DISTRIBUTION TRANSFORMERS



parative tensile strength tests are made on samples of new material and on samples which have been aged in oil to determine the ability of the product to withstand the deteriorating effects of the oil.



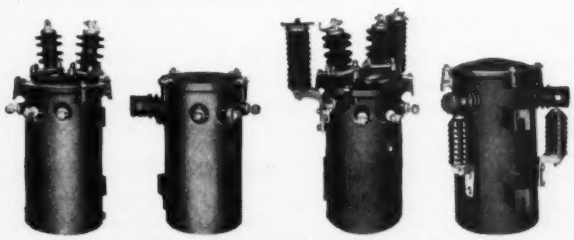
HiperCore transformer tank is individually pressure-tested in this special spray machine, before painting.

Periodic surge tests are made on samples from the production line. Film strip of cathode ray oscillograph reveals capacity of transformer to withstand surges in excess of those normally encountered in service.

Step by Step... tested to be BETTER!

From the first step in the manufacture of Moloney HiperCore Distribution Transformers a *better* transformer is in the making. ASA tests prescribed by the industry are made to be sure that our product conforms to industry standards, but many additional tests are also made in all stages of manufacture and assembly to insure *better* all-around performance in the finished product.

This *Better Performance* starts with quality control of the raw materials and does not end until the transformer is completed. The fine reputation of Moloney Transformers, which is taken for granted by many utilities, has been achieved because of these rigid controls.



Moloney HiperCore Distribution Transformers are available in all standard ratings from 3 Kva up in both Conventional and CSP designs.

MES3-1

COMPANY

Transformers • Step Voltage Regulators • Unit Substations

SALES OFFICES IN ALL PRINCIPAL CITIES

MOLONEY ELECTRIC = { BETTER PERFORMANCE / GREATER RELIABILITY / LESS MAINTENANCE

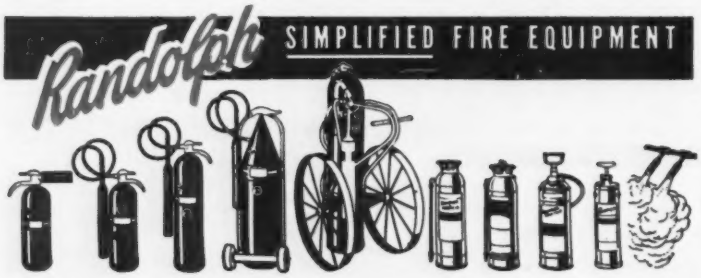
HERE'S THE EXTINGUISHER YOU PICKED AS "EASIEST TO USE" OVER THREE OTHER LEADING BRANDS . . .

Safety and Plant Engineers—here's how you voted: In a national survey recently completed, 100% of your replies stressed *ease of operation* as a major factor in Extinguisher selection. And on the basis of being "easiest to use", 86% of your replies specified Randolph over the nearest brand—66% specified Randolph over *three* other leading brands, *combined!*

With no nozzles to adjust, no valves to turn, Randolph Extinguishers are 100% panic-proof. Just snap from the bracket, aim and press the trigger. You KNOW how to use this extinguisher *just by looking at it!*

COMPLETE LINE OF EXTINGUISHERS AND AUTOMATIC EXTINGUISHING SYSTEMS

Make sure your plant is mobilized for fire . . . with easy to use, simplified RANDOLPH Equipment. Sizes from 2½ to 50 lbs. Manual and automatic systems. Write Randolph Laboratories, Inc., 12 E. Kinzie St., Chicago 11, Illinois.



This may not be adequate for the coldest days, but this is not too great a factor because there are usually about six such days per season.

In the average dairy farm operation with water heaters in the home and the combination units in the milk house, it is possible to sell 7,000 to 8,000 kwhr of potential off peak energy per year to each farm.

Other Wrinkles . . . Another manufacturer uses a U-tube through the water heater for heat absorption. A fan forces air circulation under thermostat control when heat is needed.

The third manufacturer uses the top heater element channel for absorption and discharge of heated air.

There are some six other acceptable methods of supplying heat to milk houses and egg grading rooms. Farm service advisors in the area are setting forth the operational characteristics of each and letting the farmer decide for himself. Some 1500 forced air circulating, electrically operated heaters were sold last season. In addition, there were many infrared heat lamp units and other infrared devices sold.

Luminaire Testing Lab Opened by Holophane

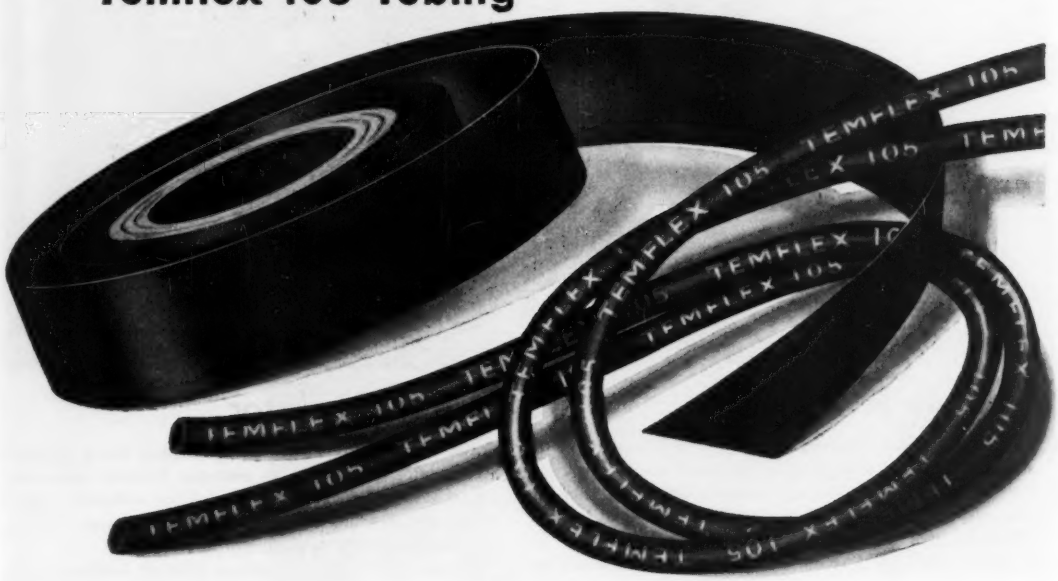
Holophane Co, Inc, has opened a new engineering center at Newark, Ohio, feature of which is a new photometer with a clear test distance of 25 ft, assuring testing of all luminaires, both vertically and horizontally, under actual application conditions.

A photoelectric cell traveling on an arc of 25 ft radius registers the light output. By turning the units in the photometer upside down, upward light components can be measured. To get readings at various lateral orientations, the units can be turned in the photometer by rotating them in a horizontal plane.

Movement of the photoelectric cell and the rotation of the units in the photometer head are carried out by electric motors connected to an electronically operated pushbutton system, thereby making it possible for the photometer to be operated by remote control.

Separate general testing laboratories facilitate efficient handling of various tests such as heat, endurance, vibration, and weathering.

Now— an Irvington
PLASTIC INSULATING TAPE
with the heat- and oil-resistance of Temflex® 105 Tubing



Here is a new addition to the Irvington family of insulating tapes — Temflex 105 Plastic Tape, based on the *same* formula that has made Temflex 105 Tubing the leader where service calls for continuous operation in air at 105° C. — or in oil at 90° C.

Temflex 105 Tape is strong and flexible — possesses exceptional elongation. It can be easily hand wound over bus bars, coils, cables — even over very irregular surfaces — or can be used in taping heads. Temflex 105 Tape frequently offers substantial savings as compared with varnished cambric. Easily baked to a homogeneous mass, it also offers cost economies over pressure-sensitive tapes.

Made in thicknesses of .007", .010" and .012"; widths from ½" to 34". Dielectric strength as high as 1200 vpm *even at 100° C.* Tensile strengths up to 3100 psi — elongation 165% to 240%.

You probably know Temflex 105 *Tubing* — you'll certainly want to learn about Temflex 105 *Tape*. Mail the coupon for technical data sheet.

Look to
IRVINGTON
for Insulation Leadership

INSULATING VARNISHES
VARNISHED CAMBRIC
VARNISHED PAPER
VARNISHED FIBERGLAS
INSULATING TUBING
CLASS "H" INSULATION

IRVINGTON INSULATION

Send this convenient coupon now

Irvington

VARNISH & INSULATOR COMPANY

21 Argyle Terrace, Irvington 11, New Jersey

Plants: Irvington, N. J.; Monrovia, Calif.; Hamilton, Ontario, Canada

Irvington Varnish & Insulator Company EW 6/53
21 Argyle Terrace, Irvington 11, New Jersey

Gentlemen:

Please send me technical data sheet on your new Temflex 105 Tape.

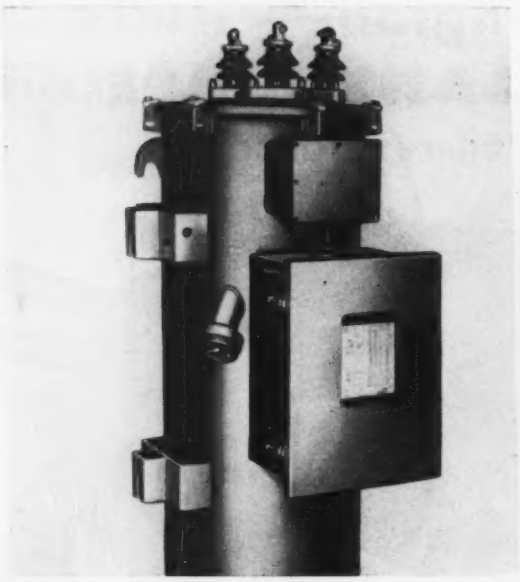
Name..... Title.....

Company.....

Street.....

City..... Zone..... State.....

NEW EQUIPMENT

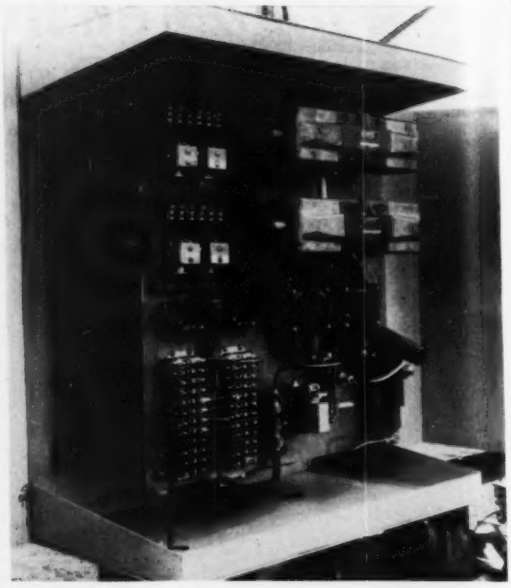


Voltage Regulator

Type PRS is a single-phase, 60-cps, pole-type regulator especially applicable to branch and rural lines. It is completely self contained and automatic in operation. Regulation of plus or minus 10% is provided in 32 equal steps of ⅝% of rated voltage.

Regulation is performed by a series of tapped windings, and a drive and switching mechanism. It is controlled by a line-drop compensator. Regulators are available in several voltage ratings.

Moloney Electric Co, St. Louis 20, Mo.

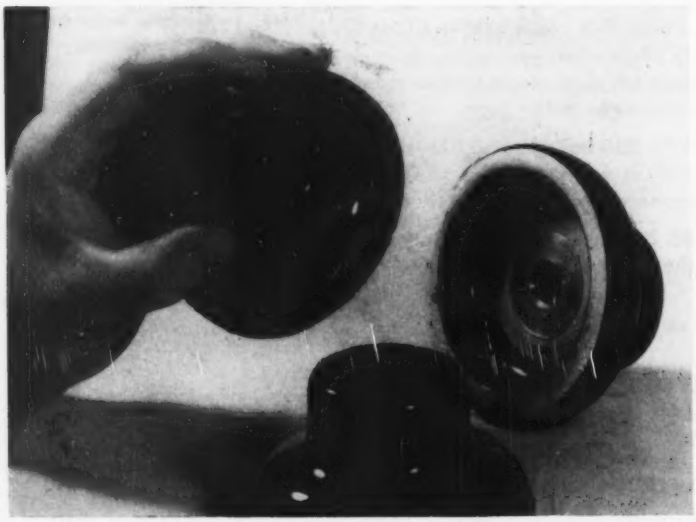


Switch Operator

For operating switches, the mechanism has a hydraulic accumulator, employing an inert-gas bladder under pressure that stores energy until needed for switching. Mechanism will operate two switches with separate relaying. A pump maintains accumulator pressure.

Advantages of the unit are as follows: Multiple operations without station power, high-speed operation, adjustable time cycle, and control and pump circuits can be fed from same or different power sources.

Royal Electric Manufacturing Co, Chicago, Ill.

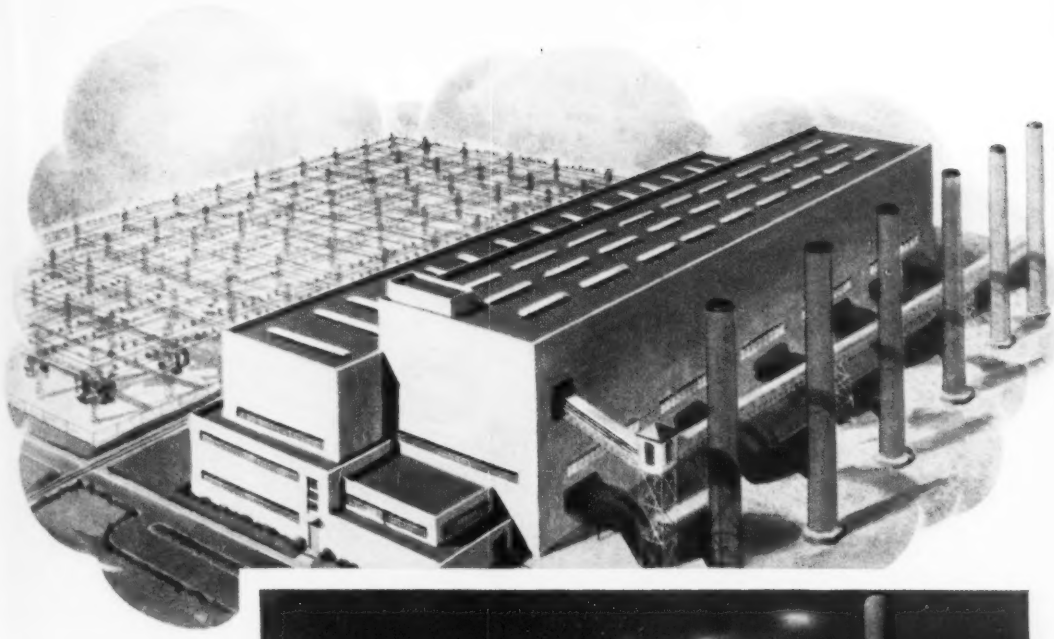


Bolt Insulator

Called a bolt-end insulator, the unit is designed to shield projecting ends of transformer support bolts. Its purpose is to protect personnel from the less obvious danger of bolts that are grounded through a grounded transformer housing.

Insulator is made from porcelain, chocolate glazed, with a metal thimble in the center threaded for ⅝-in., 11-threads per in. bolts. It is said to be efficient and neat in appearance.

Lapp Insulator Co, Inc, Le Roy, N. Y.



Portsmouth Power Station is designed for an ultimate total of six units, each of 100,000 kilowatt nameplate capacity

More Kilowatts for a Growing Region

The system-wide generating capacity of Virginia Electric and Power Company was increased to nearly 1,000,000 kilowatts early in 1953 and in 1954 it will be further augmented by an additional unit of the Portsmouth Power Station near Portsmouth, Virginia.

The initial unit of this new station, a 100,000 kw preferred standard machine, is already "on the line".

Stone & Webster Engineering Corporation was retained for the design and construction of the new facilities.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY *of* STONE & WEBSTER, INC.

Remington Rand Univac Electronic Computers Now Make Available...

FASTER FACT-POWER FOR MANAGEMENT

Reels of magnetic tape are utilized with REMINGTON RAND ELECTRONIC COMPUTER SYSTEMS solving intricate computations for business, for industry, for science, for government. They operate at speeds that put facts at management's fingertips with breath-taking rapidity. They give management *today* data which it formerly had to wait months to obtain.

One inch of magnetic tape, the input medium for Remington Rand UNIVAC, holds even more information than a punched card. One reel holds 1,400,000 numbers or letters. Two 4-drawer tabulating-card files, storing more than 20,000 cards, are compressed into a single eight-inch reel.

A Computer for Every Need

You expect leadership from the leader . . . and Remington Rand machines, using magnetic tape in addition to all other input media, offer the greatest variety of equipment for every computing job.

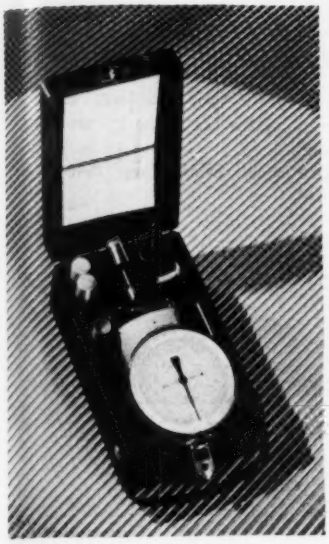
With the UNIVAC Fac-Tronic all-purpose computer system you can switch quickly from accounts receivable to payroll preparations, to matrix algebra to differential equations. The new ERA 1103 general-purpose computer system performs feats of mathematical computations, industrial and economic planning, and automatic process control — at speeds undreamed of a few years ago. The Remington Rand Punched-Card Electronic Computer handles computations, records, and general accounting problems. (Also, Remington Rand will design and build computers to specifications to solve *your* specific problems.)

For free descriptive folder, "UNIVAC," EL 109.1, write on your business letterhead to Room 2843, 315 Fourth Avenue, New York 10, N.Y.

THE FIRST NAME IN BUSINESS ELECTRONICS

Remington Rand INC.

Eckert Mauchly Division: Univac Fac-Tronic System
Remington Rand: Punched-Card Electronic Accounting Machines
Engineering Research Associates Division: ERA 1103 General-purpose Computer System

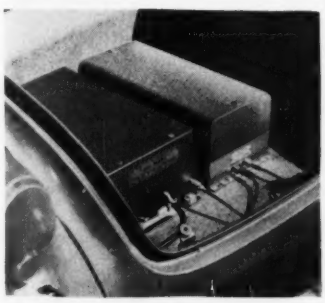


Hand Tachometer

Type UO with five ranges has an improved slip coupling with overspeed device, which prevents damage to tachometer mechanism due to accidental overspeeding on the wrong range. It can be used with accuracy in any position, is independent of direction of rotation, and is unaffected by temperature variations.

They are direct reading in rpm and are available in four models—30 to 12,000 rpm, 45 to 18,000 rpm, 60 to 24,000 rpm, and 120 to 48,000 rpm.

Herman H. Sticht Co, Inc, New York, N. Y.



Radio Booster

Called Kaar Power Booster, it is said to increase power output of any 10-w mobile radio-telephone transmitter six times. Booster is inserted between low-power transmitter and antenna. Power desired is selected by

AVAILABLE in 2400 volts

with R T & E's
EXTERNALLY OPERATED TAP CHANGER

just a TWIST of the WRIST CHANGES TAPS

IN STOCK — AVAILABLE FOR IMMEDIATE SHIPMENT
WRITE FOR SIZES AND PRICES

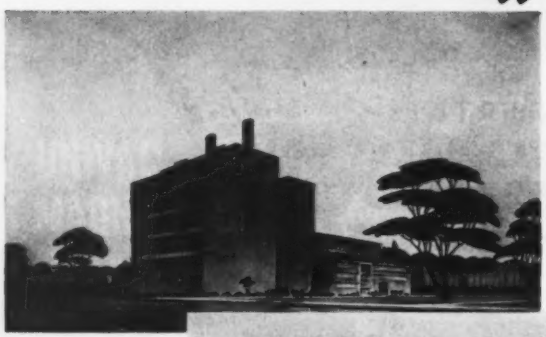
EXTERNAL TAP CHANGERS are standard on all sizes at no additional charge — Eliminates opening tank to change taps — Marked for convenience and tap position.

432 N. 8TH ST. MILWAUKEE 3, WISCONSIN
R T & E Co.
BRANCH PLANT: WAUKESHA, WISCONSIN

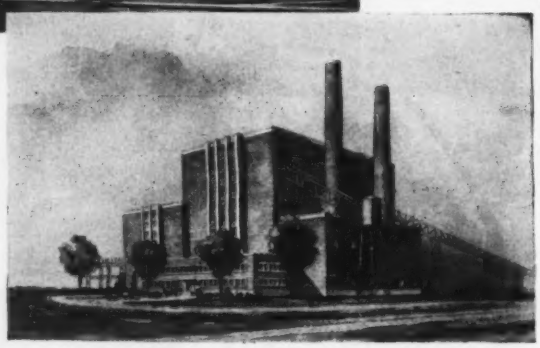
ON THESE TWO INSTALLATIONS

the AEROTEC SERIES

Assures 97.5% FLY ASH COLLECTION *Efficiency*



LEFT: The 264,000 kw (four units) J. Clark Keith Generating Station of The Hydro-Electric Power Commission of Ontario at Windsor, Canada. H. G. Acres & Co., Niagara Falls, Ontario, Consulting Engineers.



RIGHT: The 400,000 kw (four units) Richard L. Hearn Generating Station of The Hydro-Electric Power Commission of Ontario at Toronto, Canada. Stone & Webster Engineering Corp., Boston, Mass., Engineers and Constructors.

Here's on-the-job proof that Aerotec Series Mechanical-Electrical Dust Collectors are used for continuous efficiency. Guaranteed 97.5%, at normal full load the overall efficiency is anticipated as high as 99% at these two Canadian generating stations of The Hydro-Electric Power Commission of Ontario. Aerotec Series Collectors serving each plant combine a design 3RAS Mechanical and an Electrical Precipitator.

In the Mechanical unit, small diameter, permanent molded aluminum tubes provide high efficiency. Exclusive Aerotec pocket type collecting electrodes in the Electrical Precipitator reduce reentrainment of dust in the gas stream, contributing to a sharp improvement in stack appearance. The combined actions of these units assure maximum dust collection efficiency. Many Aerotec Series installations verify that fact.

Your plant can eliminate dust nuisances with Aerotec equipment just as many well-known companies have done. This highly successful performance is a reliable measure of Aerotec ability to solve your dust collection problems. Write our Project Engineers today!

Project Engineers

THE THERMIX CORPORATION

GREENWICH, CONNECTICUT

(*Offices in 38 Principal Cities*)

Canadian Affiliates: T. C. CHOWN, LTD.

Montreal 25, Quebec Toronto 3, Ontario

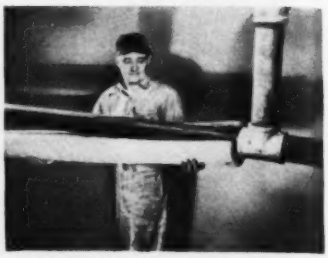
THE AEROTEC CORPORATION

GREENWICH, CONN.

a switch on the dashboard and booster is activated when the microphone button is pushed.

Equipment is available for the 152- to 174-Mc band, and will soon be available for use in the 25- to 50-Mc band.

Kaar Engineering Corp, Palo Alto, Calif.



Pipe Insulation

Available in 6 ft lentghs, the one-piece glass fiber pipe insulation features: Low thermal efficiency, light weight, flexibility, resilience, non-breakable, insoluble in water, cuts readily with a knife, clean and pleasant to handle, and can be painted. It is composed of extremely fine, blown-glass fibers, bonded with a phenolic resin, and molded into one piece sections.

Claimed not to rot, mold, decay, or absorb moisture, it is said to resist attack of most acids and alkalis. This insulation is suited for all heated piping applications up to 350 F, or as a second layer of insulation in high temperature applications.

Gustin-Bacon Mfg Co, Kansas City, Mo.

Pyrometer

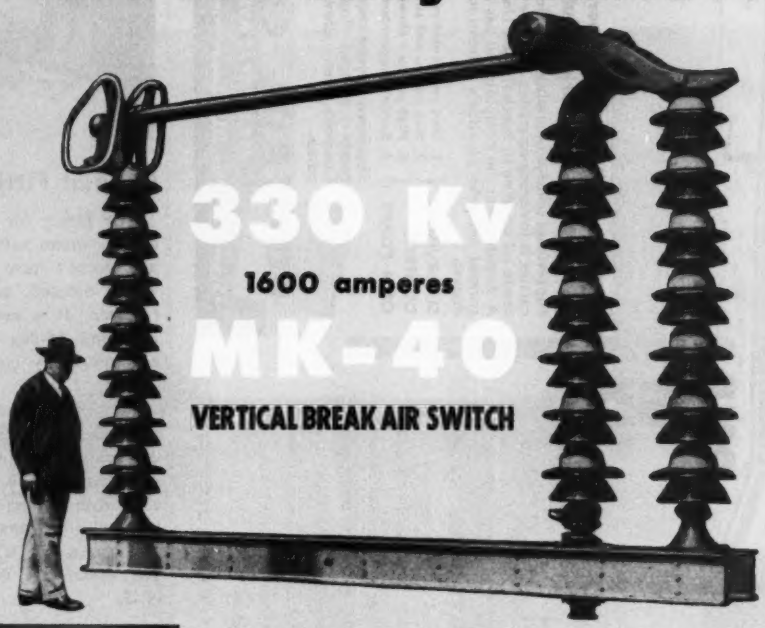
The dual range indicating millivoltmeter pyrometer, incorporating a plug-in feature, is said to be stable in operation, relatively free from effects of vibration and temperature, and more easily serviced. Housed in a die-cast aluminum case, the instrument has two compartments.

Upper compartment contains plug-in galvanometer unit that is totally enclosed. Terminal connectors are in lower compartment.

Two combinations of ranges—0 to 2,400 F and 0 to 3,000 F, and 0 to 2,000 F and 0 to 3,000 F—will be offered as standard. For each com-

1ST DELTA-STAR reports that

the First 330 Kv switches are now being installed . . .



Again, final testing has proved the correctness of design and construction of the first commercially produced 330 Kv Vertical Break Air Switches in the U.S.A. These massive Delta-Star switches are now being installed with the positive assurance that they are more than adequate for the service they are designed to perform.

Another "first" has again been added to Delta-Star's quarter-century record of constant research and development in the manufacture of high voltage switching equipment incorporating the latest and most refined improvements. Look to Delta-Star for all your switching equipment requirements from 7.5 Kv to super-high voltages.

WHEN YOU WANT THE BEST IN HIGH VOLTAGE SWITCHING EQUIPMENT, SPECIFY DELTA-STAR

DELTA-STAR ELECTRIC DIVISION

H. K. PORTER COMPANY, INC.
2437 FULTON STREET, CHICAGO 12, ILLINOIS
DISTRICT OFFICES IN PRINCIPAL CITIES

H.K. PORTER COMPANY, INC.

ONE of SIX
pipelines use Super-Trol* too!
Substation
Dispatcher's Control Panel (Note room for expansion.)
• pipelines using either Supervisory Control or Telemetering Equipment
Supervisory control operating over telephone line carrier is lowering operating costs for a 300 mile crude oil pipeline in South Central United States. A dispatcher at the pumping end has continuous control over the pipeline's substation 60 miles distant.
SUPERVISORY CONTROL OF 4 PUMPS
1. Start pumps and supervise
2. Stop pumps and supervise
3. High pressure shutdown
4. Bearing temperatures, sump pump and other alarms
Shutdown feature requires a high pressure surge action before pump is stopped. Engineered in anticipation of future growth, Control's system allows for two more substations and one more pump.
CONTROL CORPORATION
719 CENTRAL AVE. N. E. • MINNEAPOLIS 14, MINN.
• Super-Trol • Peak-Trol • Telemetering • Battery Chargers • Carrier Current •
CONTROL CORPORATION EQUIPMENT is engineered to overcome the distance problems of crude oil and product pipeline companies. Super-Trol works over telephone pairs, carrier current, or microwave. If you are concerned with operating a pipeline, regardless of distance, write for complete information.
*Super-Trol is Control Corporation's system of remote, supervisory control.

bination of ranges a different galvanometer is supplied. Thermocouples are used for the detecting element.

Minneapolis-Honeywell Regulator Co, Philadelphia 44, Pa.

Conduit Fitting

The fitting for liquid-tight flexible conduit mates with any conduit spiral and doesn't have to be taken apart when installed, according to manufacturer. It is made in straight, 90-deg, and 45-deg elbow designs and accommodates conduit from ⅜ to 2 in.

End of fitting facing the junction box has sufficient length to accommodate double locknuts used with sheet metal boxes. The fitting's body is die cast from a high-strength zinc alloy for the three smallest straight sizes. Other sizes are of malleable iron.

The Thomas & Betts Co, Elizabeth, N. J.

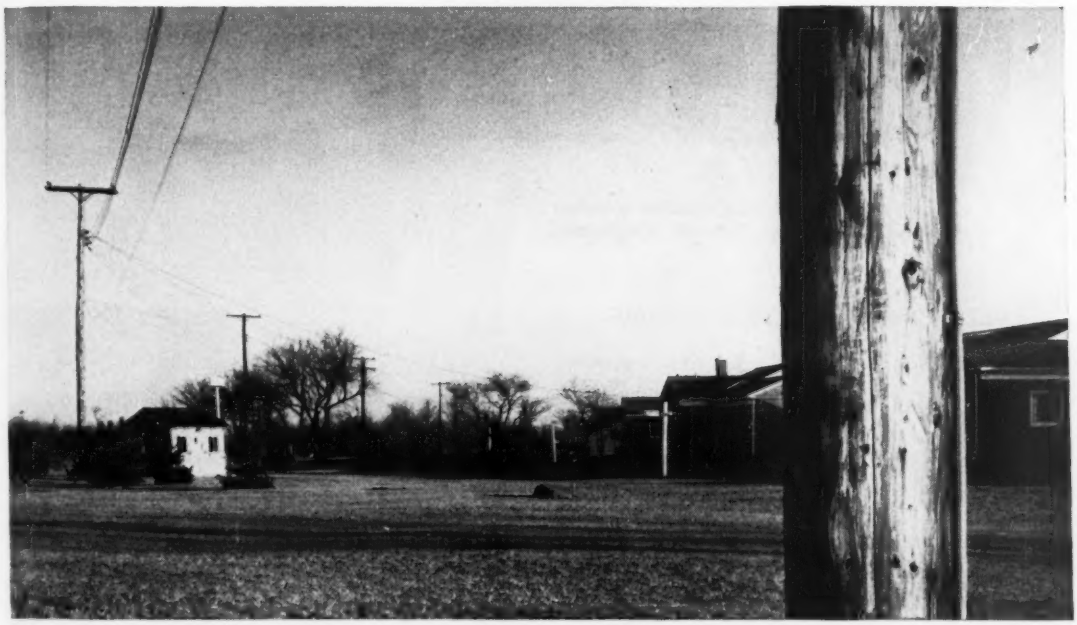
Telephone Switchboard

The switchboard is to connect a telephone system with a mobile two-way radio system, microwave system or power-line carrier system. It manually connects any one of five subscriber common battery telephone

DOW

PENTA-TREATED POLES MAKE GOOD NEIGHBORS

Detroit Edison builds for the future and for its customers with clean, treated poles



The Dow Chemical Company
Dept. PE 3-2B2-A Midland, Michigan

_____ Send me free booklet, "Pointers on Penta".

_____ Send me list of PENTA treating plants.

_____ Please have technical representative call.

Name_____

Title_____ Company_____

Address_____

City_____ State_____

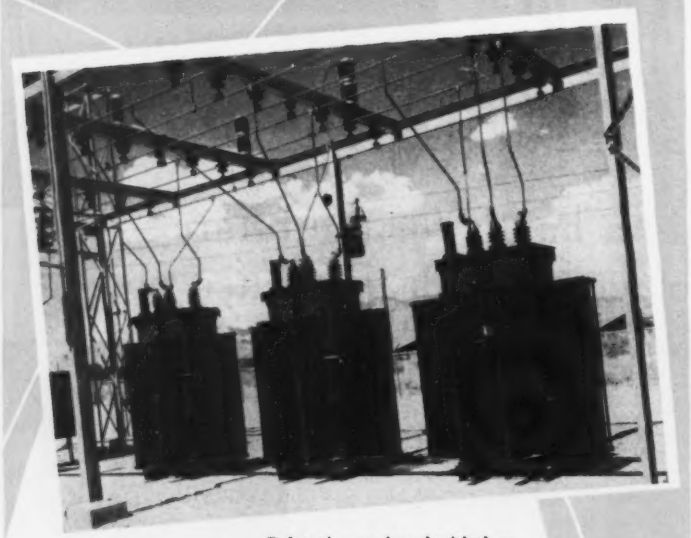
Looking for a *good neighbor policy?* Specify *clean*, full-length PENTA* treatment for all utility poles.

Over the years, PENTA-treated poles have been doing double duty for the Detroit Edison Company. In residential areas these poles are doing their share in maintaining good customer relations because they are clean, attractive—fit well in modern settings. They are also keeping repair and replacement costs at a minimum by resisting decay and termite damage. PENTA-treated poles last many years.

Specify clean, PENTA-treated poles for all settings—they make good neighbors, save you money. Write Dow today for complete information about *clean* *PENTAchlorophenol, the modern wood preservative. THE DOW CHEMICAL COMPANY, Midland, Michigan.

you can depend on DOW CHEMICALS

DOW



Substation equipped with three 1250 KVA single-phase Stockwell transformers.

EVERY STOCKWELL TRANSFORMER
is the result of specialized research and sound design. Rigidly controlled materials and modern production facilities are additional guarantees of the quality of our products.
Our field organization and our staff of application engineers at Akron will be glad to help you on all your transformer and substation problems.

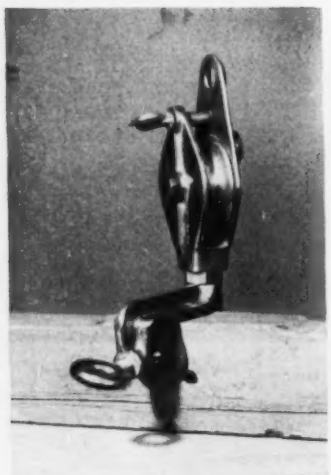
STOCKWELL
TRANSFORMERS
DESIGNED FOR YOUR REQUIREMENTS

STOCKWELL TRANSFORMER CORP.
AKRON, OHIO
OIL-FILLED, DRY TYPE, and ASKAREL-FILLED DISTRIBUTION AND POWER TRANSFORMERS

3-1

lines to a radio system by simply pressing a button to select the desired circuit, it is claimed.

Each vertical row of buttons is assigned to a subscriber, trunk line or radio channel. Last vertical row on the right consists of dispatcher's answering and monitoring buttons. Talking channel's follow across the row of buttons horizontally with each channel's supervisory disconnect lamp at the left of each horizontal row.
Motorola Communications and Electronics, Inc, Chicago 51, Ill.



Stringing Block

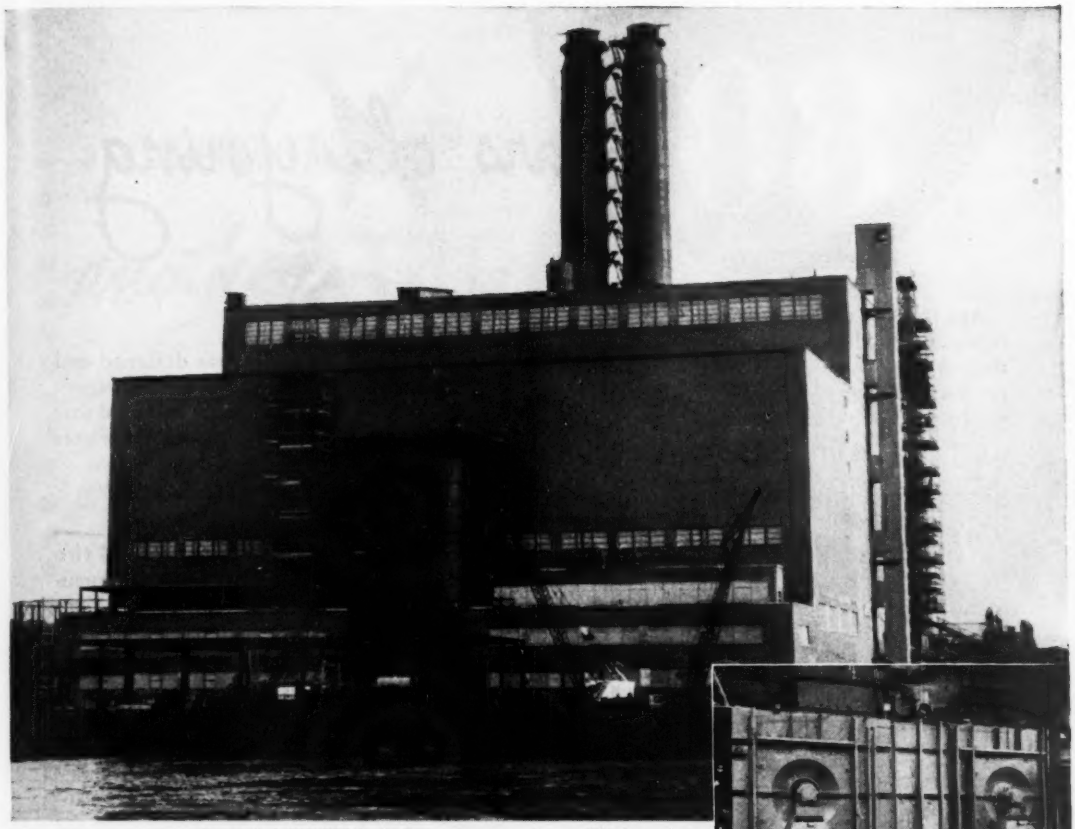
It is designed for stringing distribution and transmission conductors across top of cross arms. Block can be attached to pole or hung from insulator. It is made from high tensile alloy with bronze fittings, weighs seven lb, and is cadmium plated.

Sheave housing has a lip that overhangs sheave to prevent stranded wire from slipping between sheave and housing. Because sheave is made of soft metal it is said to be non-injurious to wire.
J. F. Hodgkins Co, Gardiner, Me.

Wireway

Designed to speed installation, the wireway covers are fastened by two screws. Other cover fasteners are of the lock type. Sections are joined by connectors, tees and elbows, which require one screw that locks a hook and

(*Continued on page* 176)



Astoria's 1,200,000 lb. boilers are among the world's largest. Sturtevant fans furnish 600,000 CFM forced draft on each.

NEW AIRFOIL FANS

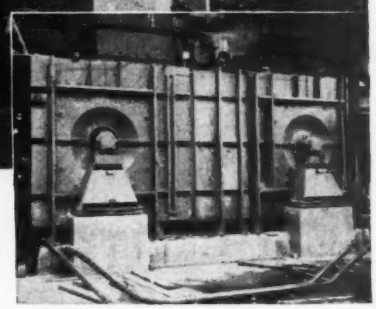
GIVE GREATEST ECONOMY AT ASTORIA

Pressurized boilers at Consolidated Edison's Astoria Station are designed to operate without induced draft. In a fan arrangement never before used by a public utility, eight new Sturtevant Airfoil-Bladed Fans are connected in series of two for forced draft.

Each tandem is rated for 300,000 CFM at 38" pressure. At part loads, only one fan of each pair is used. Thus the fans operate at or near peak efficiency at all times.

Airfoil-Bladed Fans retain the self-limiting horsepower characteristics and reach peak efficiencies of *over 90%*. They are designed primarily for application where low operating cost and quiet operation mean more than first cost.

For full information on the Airfoil-Bladed Centrifugal Fan, ask for new Catalog 1320. Call your Westinghouse-Sturtevant office. Westinghouse Electric Corp., Sturtevant Division, Hyde Park 36, Mass.



The "boxcar" being installed above houses two Airfoil Fans in tandem. Two units totaling four fans serve each boiler. A unique by-pass system permits operation of any two fans in each four-fan unit. All fans are equipped with power-saving Vane Control® to permit instantaneous control of output.

WESTINGHOUSE AIR HANDLING

YOU CAN BE SURE...IF IT'S Westinghouse

80 years ~~old~~ young

Age in itself means very little. But age accompanied by historic achievements and age that is continuing to produce the finest products of their type is something of which we are proud.

1873

Founded in 1873, The R. Thomas and Sons Company very early became closely allied to the electrical industry.

1885

In 1885, the first "Thomas Quality" insulator was produced, the first shipment going to the U.S. Electric Lighting Co., Chicago.

1893

In 1893, all of the porcelains used in the lighting arrangement for the World's Fair at Chicago, installed by Westinghouse, were Thomas.

1896

In 1896, Thomas perfected the first multi-part, high-voltage, pin-type insulator. It was known as the "Boch" Glaze-Filled Insulator, later to be patented under No. 600,475. It represented the initial step toward making possible the transmission of electrical energy at higher voltages.

1907

In 1907, Thomas designed and made the first cap-and-pin suspension insulator. Units installed that year are still giving trouble-proof service after 46 years of continuous operation.

1917

In 1917, we introduced the Thomas link-type Hewlett suspension insulators. Insulator failure being virtually unknown with this design, it is easy to understand why hundreds of thousands are still giving satisfactory service today.

1938

In 1938, Thomas engineers pioneered and were first to develop the under-glaze metallic oxide coating that guarantees the "noise-free" operation of the patented Thomas "Q-T" Insulators. (Patent No. 2154387)

These are among the many Thomas "Firsts" and contributions which have helped the Electrical Industry reach its present position.

TODAY, in our 80th year, we are ready with improved facilities and increased capacity to meet the most exacting needs of the Industry. After all is said, it's still quality that counts plus proper designing, precision manufacturing . . . and PROOF OF PERFORMANCE. Why gamble?

The R. Thomas and Sons Co.

LISBON, OHIO

NEW YORK CHICAGO

Sales Representatives: C. G. Anderson, *Chicago* • E. B. Anderson Co., *Detroit* • Conrad R. Bangh, *Omaha* • Ken H. Best, *Seattle* R. E. Cunningham & Son, *Los Angeles* • W. H. Eddy Electric Products, Inc., *Phoenix* • Engineer Sales Co., *St. Petersburg* • Electrical Distributors Co., *Philadelphia* • Hamilton Associates, *Denver* • Geo. E. Honn Co., *San Francisco* • Hugo Sales Co., *Minneapolis* • John G. Pettijohn Co., *Knoxville* • H. E. Ransford Co., *Pittsburgh* • J. F. Schaefer & Co., *Kansas City* • R. J. Sullivan Co., *Boston* • Tafel Electric & Supply Co., *Louisville* • Walter E. Thompson Co., *Birmingham* • Triangle Electric Supply Co., *El Paso* • United Electric Supply Co., *Salt Lake City* Williamson Sales Co., *Shreveport, Amarillo, Corpus Christi, Dallas, Houston, New Orleans, Pine Bluff* • *Representatives in other principal cities*

...and now IN 1953, another THOMAS FIRST...

... A new petticoat design in the 10-inch suspension insulator that positively prevents chipping or breaking of inner petticoats. This protection is assured by eliminating the destructive bumping of caps or clamp fittings against the petticoats, yet complete interchangeability with all current designs is guaranteed as required by NEMA Standards. Only this new Thomas design can guarantee that it is virtually impossible to damage inner petticoats by rough handling during assembly or disassembly in the field.

●Naturally, we are excited. We believe our new petticoat design to be the answer to the insulator breakage problem, during construction, which has plagued the Industry for years. This design accomplishes positive elimination of insulator breakage during construction due to rough handling in coupling and uncoupling insulator units and in installing hardware fittings to the insulator strings.

Of course, the greatest benefit of this new design will be realized with the close-spaced, five-inch spaced units, but for all insulator spacings, our new design assures more ruggedness with resulting longer life . . . and at no additional cost to you!

The foregoing are bold statements. However, our most severe tests prove them and they are too important for you not to verify.

We suggest that you order TODAY, a standard crate of 6—No. 21239 THOMAS 1953-DESIGN SUSPENSION INSULATORS. Test them thoroughly . . . and compare with other five-inch spaced designs.

Specify **THOMAS INSULATORS—THE BEST BY LINE TEST**

The R. Thomas and Sons Company is a manufacturer and designer of all types of porcelain insulators . . . pin-type, switch, suspension, spools, guy-strain, bushings and special high-voltage porcelain. In addition, Thomas supplies associated line hardware, clamps, fittings, and so on.

be sure of

UNIFORMITY. . . use

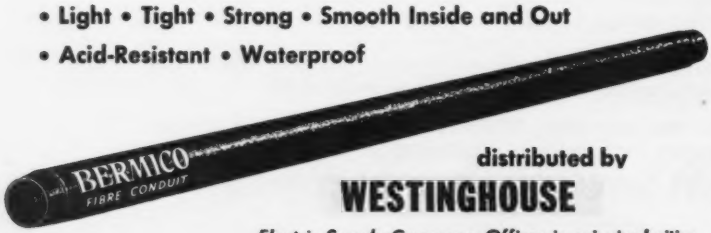
BERMICO® FIBRE CONDUIT

Uniform wall thickness • *Uniform* diameter of bore • *Uniform* impregnation • *Uniform* quality of fibre.

Automatic forming and processing . . . close controls over the drying process . . . machining of taper and length . . . four rigid factory inspections—these are the things that guarantee Bermico's uniformity of dimensions, specifications and quality.

For surest cable protection, be sure to specify Bermico Fibre Conduit. Made by Brown Company from sturdy wood fibre, impregnated with pitch, it is—

• Light • Tight • Strong • Smooth Inside and Out
• Acid-Resistant • Waterproof



distributed by
WESTINGHOUSE
Electric Supply Company. Offices in principal cities

BROWN COMPANY, Berlin, New Hampshire
CORPORATION, La Tuque, Quebec

SOLKA & CELLATE PULPS • SOLKA-FLOC • NIBROC PAPERS • NIBROC TOWELS • NIBROC KOWTOWLS
NIBROC TOILET TISSUE • BERMICO SEWER PIPE, CONDUIT & CORES • ONCO INSOLES • CHEMICALS

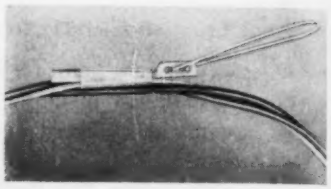
New Equipment

(*Continued from page* 172)

slot arrangement. Connectors and fittings also have removable face plates.

Straight sections are available in lengths of one, two, three, four, five and eight ft, all in four cross-sectional sizes—4x4, 4x6, 6x6 and 8x8 in.

Trumbull Electric Department, General Electric Co, Plainville, Conn.



Service Clamp

Called Reliable 7080, it permits easy attachment to bare neutral of twisted service drop cable. Installation is accomplished by slipping the aluminum shell around bare neutral and inserting stainless wedge along steel rails. It is said to grip securely and tighten automatically under load.

A stainless steel bail can be used with hooks, spools or knobs. Wedge clamp is suitable for open wire, aluminum services of all No. 6 and No. 4 sizes, and No. 2 solid.

Reliable Electric Co, Chicago, Ill.

Signal Generator

For use in laboratories, the signal generator covers the VHF through UHF frequency range of 54 to 950 Mc. Range of 54 to 330 Mc is in the first band and from 300 to 950

(*Continued on page* 181)

IT TAKES MORE THAN THIS HAMMER BLOW TO INJURE

VICTOR PURIFIED PORCELAIN!

See that hammer falling? It's about to strike the outer edge of a Victor Suspension Insulator with a blow that *greatly exceeds specifications!* This is routine control procedure in Victor's test laboratories. It proves that insulators made of *Purified Porcelain* consistently withstand impacts in excess of NEMA standards. This finest porcelain ever made is more dense, harder, tougher and far more resistant to impact than any other porcelain yet developed. For full data on Victor Suspension Insulators, write for Bulletin No. 4.

Victor No. 900, 10" Suspension Insulator being subjected to impact test in Victor's Test Laboratories.

FREE BOOKLET gives you the full story on how Victor insulators are made—how and why *Purified Porcelain* was developed. Write us for your copy.

VICTOR NO. 900 SUSPENSION

Specify VICTOR INSULATORS!

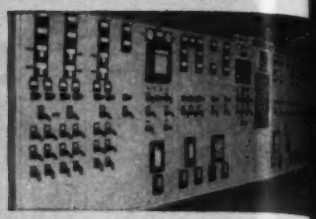
VICTOR INSULATORS, INC., VICTOR, N. Y.

Low and High Voltage Pintypes • Suspensions • Guy Strains • Spools • Switch and Bus Insulators • Custom Designed Porcelains

ALLIS-CHALMERS

MERCURY ARC RECTIFIERS

1. Two of these Allis-Chalmers outdoor oil circuit breakers guard the power entrance to the plant and two more serve as tie breakers. Each breaker is rated 3 cycle, 1200 amps, 161 kv, 7,500,000-kva interrupting capacity.



2. Duplex, tunnel-type main control board is located in rectifier room. It meters and controls all equipment in plant — from the 161-kv oil circuit breakers down to the mercury arc rectifiers and plant power substations.

For Non-Stop DC Power

It's Allis-Chalmers from 154-Kv Lines to Rectifiers in New Defense Plant

UNINTERRUPTED POWER is indispensable in the production of high purity chlorine and caustic soda in two mercury-type cell lines at the new Government-owned, Monsanto-operated plant at Sheffield, Alabama. To help meet this requirement, Allis-Chalmers supplied all of the switching, transforming and rectifying equipment.

Here's How Power Reaches Rectifiers

Under the guardianship of Allis-Chalmers 7,500,000-kva breakers, the 154-kv transmission voltage is stepped down to 13.8 kv by two transformers — each equipped for forced cooling so that either can supply the plant in an emergency.

Backed up by 1,000,000-kva breakers, the main 13.8-kv switchgear splits the electrical system into two plant power and two rectifier power sections — with bus-tie and other special provisions for reliability.

Final distribution for each plant power section is made by unit substations. Each rectifier power section goes through regulating and phase-shifting transformers and six rectifier transformers. The power is then carried through high-speed anode breakers to the 12-tube rectifier assemblies.

Incorporating many exclusive Allis-Chalmers features, the rectifiers operate in two banks of six assemblies each, to supply the two 30,000-amp cell lines.

A-C Engineering Can Serve You

For a complete rectifier plant or a single factory-packaged rectifier unit, you gain by calling in your A-C representative or writing to Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3875

WITH ALLIS-CHALMERS *EXCITRON* RECTIFIERS

You Get These 10 Mercury Arc Rectifier Advantages

- Compact and light weight — need no special foundation.
- Push-button starting with no synchronizing.
- High power factor (lagging).
- Low idling loss and high conversion efficiency.
- High momentary overload capacity.
- Immunity to frequent short circuits.
- No major moving parts—provides low maintenance and assures quiet operation.
- No attendance needed during operation.
- Resistant to dust, moisture, fumes.
- Simple construction for long life.

PLUS These 6 Exclusive Allis-Chalmers Features

Fixed excitation anode — doesn't contact mercury and is independent of level, turbulence or impurities . . . requires no adjustment, maintenance or replacement.

Continuous excitation — pilot arc always present. Eliminates need for continuous, synchronized re-ignition. Enables rectifier to ride through severe ac voltage disturbances.

Grid phase control — in cleaner region near anode, where ion density is lowest.

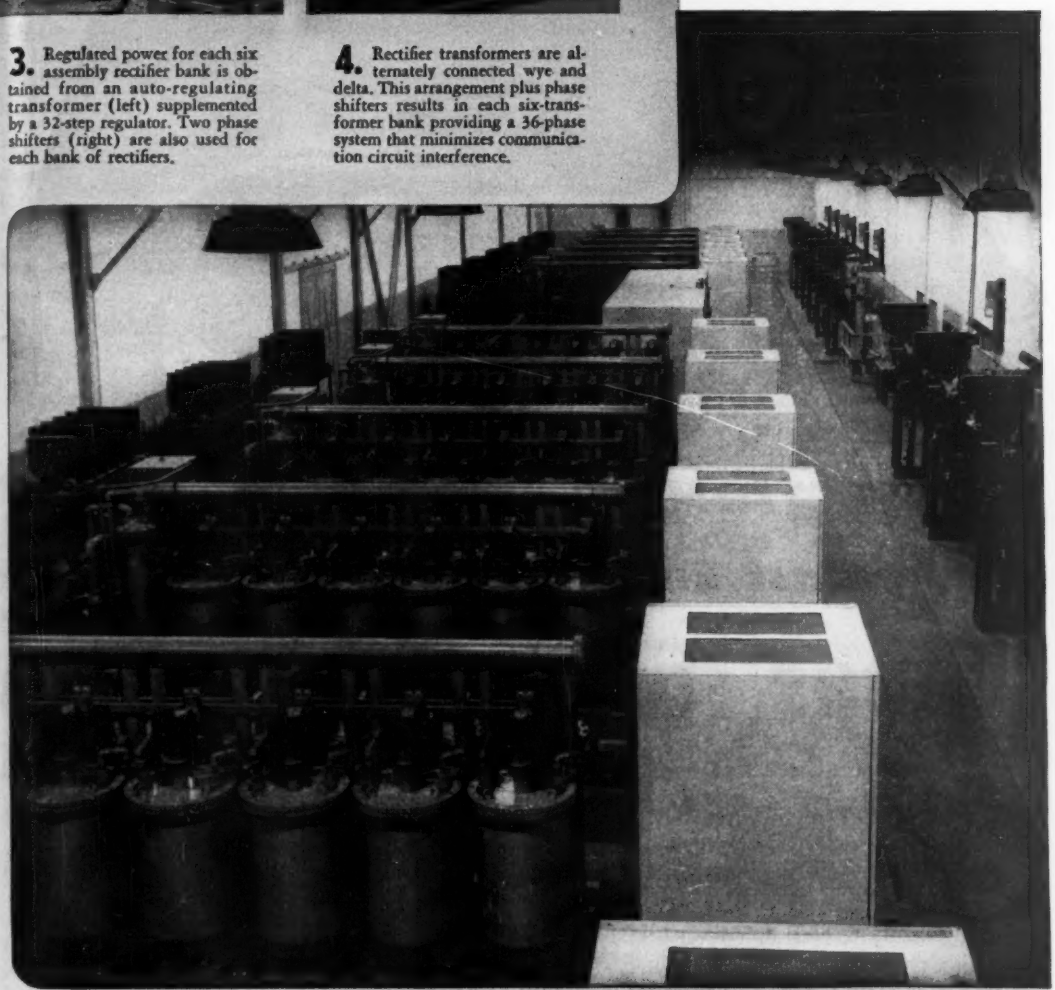
Internal cooling system — high heat transfer with seamless-tube cooling coil located within the rectifier.

Arc-over free tube — insulating entire arc path eliminates danger of arcing-over to tube.

Enamelled anode seals — multi-layer fused vitreous construction provides high-strength seal unaffected by thermal variation.

3. Regulated power for each six assembly rectifier bank is obtained from an auto-regulating transformer (left) supplemented by a 32-step regulator. Two phase shifters (right) are also used for each bank of rectifiers.

4. Rectifier transformers are alternately connected wye and delta. This arrangement plus phase shifters results in each six-transformer bank providing a 36-phase system that minimizes communication circuit interference.



5. Rectifier room, containing twelve 6000-amp, 600-volt, 12-tube, *Excitron*-type rectifiers. Each is a factory-assembled unit, complete with built-on evacuating apparatus, water-to-water heat exchanger, and water circulating, control and protective equipment. (See list at left for six ***exclusive features*** of Allis-Chalmers *Excitron* rectifiers.) In picture above at left are the anode breakers; at right, the cathode breakers with disconnect switches; and in the center, the excitation compartments containing excitation, phase control, vacuum measuring, and protective equipment.

ALLIS-CHALMERS

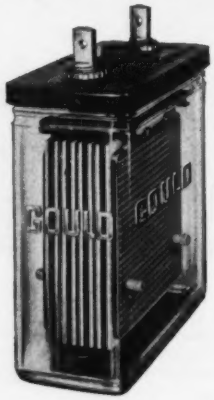
Our Engineers Introduced Mercury Arc Rectifiers to U. S. Industry

PROTECTION

Against Emergencies . . .

THANKS TO BATTERY POWER!

With Gould Plante batteries in your battery room, operation of switchgear, telephone, signal, alarm, emergency light and power systems are perfectly protected against emergencies for years to come. These pure lead batteries have rolled up amazing service records. They're famous for their ability to deliver a powerful surge or a steady flow of current the instant it's needed . . . today, tomorrow or years from now.



Specify
GOULD PLANTÉ—
The Aristocrat of Stationary Batteries

GOULD INDUSTRIAL BATTERIES

GOULD-NATIONAL BATTERIES, INC., TRENTON 7, N. J.

Always Use Gould-National Automobile and Truck Batteries

©1953 Gould-National Batteries, Inc.

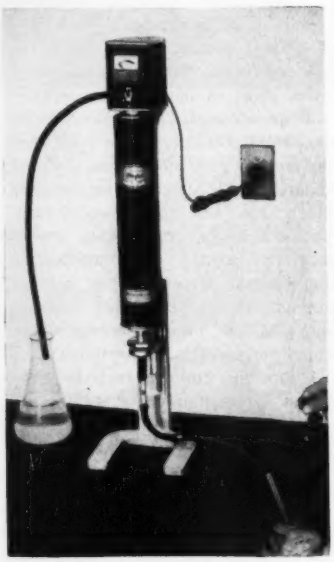
New Equipment

(*Continued from page* 176)

Mc is in the second band. Dial for two ranges is calibrated in megacycles with an accuracy of ± 2%.

Output voltage is continuously variable over the range of 10 to 100,000 microvolts. Attenuator is a capacitive wave guide beyond cut-off type, which is logarithmic. Its output is constant to ± 3 db of graduated output reading when output meter is adjusted to proper scale readings. A regulated power supply is self-contained for operation from a 110- to 130-v, 60-cps, ac supply.

Connecticut Telephone & Electric Corp, Meriden, Conn.



Demineralizer

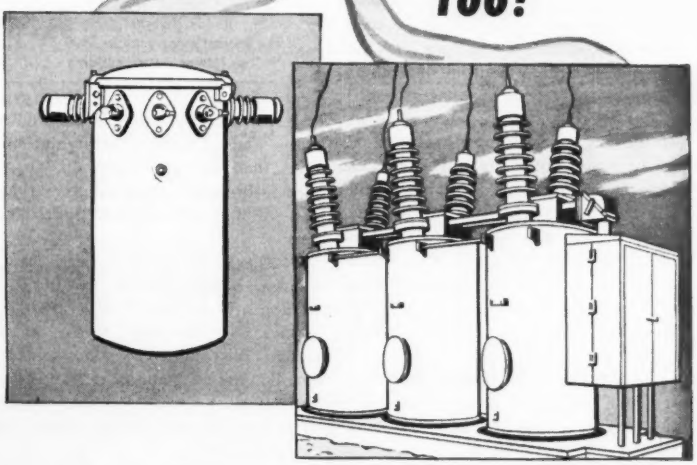
Designed to make mineral-free water in quantities up to 10 gal per hour, the unit employs a mono-column ion exchange technique. It weighs a few pounds and attaches to any wall near a tap. To operate it turn on the faucet to optimum intake flow rate and keep track of output.

With raw water containing 5 grains of solids one resin cartridge furnishes 200 to 230 gal of mineral-free water. An electric purity meter is built into unit to provide conductivity information concerning water and warns when charge requires replacing.

Penfield Manufacturing Co, Meriden, Conn.

DBPC Inhibited Oil

in Circuit Breakers, too!



WHEN DBPC (Di-tert-butyl-para-cresol) is added to transformer insulating oils, their resistance to oxidation is increased and their useful life is greatly extended. The value of Koppers DBPC as an inhibitor for new or reclaimed oil has long been proved.

Now, it has been shown that DBPC-inhibited oil can also be used in circuit breakers. The oxidation inhibitor, DBPC, does not affect arcing time, rate of gas generation, rate of carbon formation, rate of carbon settling or rate of dielectric change.

For longer oil life, for greater resistance to oxidation . . . specify Koppers DBPC. It can be used in both transformers and circuit breakers and thus, simplifies inventory problems.

Most suppliers furnish DBPC inhibited oil on request. For your convenience we can supply a compounded oil solution of DBPC called Impruval 20. The application of Impruval 20 is as simple as the application of the insulating oil itself. Write for more information on use of DBPC inhibited oil in transformers and circuit breakers.

KOPPERS®

Koppers Chemicals

KOPPERS COMPANY, INC.

Chemical Division, Dept. EW-6153
Koppers Building, Pittsburgh 19, Pa.

LETTERS TO THE EDITOR

A Mild Chiding and Some Good Advice

To the Editor:

When I read the editorial "Servant's Entrance, 1953" in the May 18 issue, I wondered, could it possibly be true that this idea, discovered by the editors of the leading journal of our industry, was new? Or, had Homer nodded a bit in the cushioned, soft chair of the editorial sanctum? So, I began to scour my memory.

I recalled that the ubiquitous Reddy Kilowatt in the late forties had been popping out of a "Servant's Entrance" (see illustration). I remembered that advertisements appeared by the hundreds, sponsored by operating companies, spelling out that idea, with apparently good results. And, I confess, it irked me a bit to think that the pundits of a great journal had either never heard or, perhaps, worse still, had forgotten. As I pondered a bit further, it became apparent that a lesson was coming my way from this experience, that such a jolt was good for both mind and soul. It became evident that our impact on human minds was too light and that we've got to do a better job of advertising and public relations together if the industry's long range objectives are to be met.

A little analysis indicated some reasons why we had failed a bit in making the "Electric Servant" idea click and stick in the public mind.

1. We've been singing too many songs at the same time instead of all joining in the one chorus.

They're all good songs, too. There's the one about free enterprise; another lifts its chords in a crescendo re encroaching socialism; still another, in definite boogie-woogie beat, hammers away at power for defense. And there are many more.

It's apparent, that in the cacaphony of many sounds, no one of them lingers too long in the memory.

If we are going to sell those kilowatts, and we must, then we had better all join in the one chorus together.

2. Some of us have been singing a bit off key. The pitch-pipe of our own company's immediate concern has sharped or flatted in relation to the broad symphony of the industry. Consequently we've been out of tune.

Reddy Kilowatt using the servant's entrance in 1949 . . . no Homer wasn't nodding

If we are going to sell those kilowatts, and we must to serve and survive, then we had better all get in tune to bring the music of our service to a willing public in perfect pitch and beat.

3. Others of us have been prima donnas, always willing to sing the leading aria in high C but unwilling to take the "bit parts" as they came along. We might be good soloists, too, but the effect upon our audience has not been what we desired. They were soon aware of our desire to "play it alone."

Nothing could be more fatal to our entire industry's well-being than such an attitude. We can be grateful that it is waning and that through industry-wide organizations and services such as EEI, ECAP, NAEC, PIP, and RK, a common front is being established, common objectives determined, common programs to meet them outlined and implemented.

We can thank American Cyanamid for refreshing our minds as to a potent selling slogan that had been developed years ago by Reddy Kilowatt but which had been lost in the shuffle of our current hectic and mixed activities. So we come back to our original premise—that we've got to do a better job together, if those kilowatts are to be sold.

Harold S. Metcalfe
Chautauqua, N. Y.

• The distinguished retired director of public relations and advertising manager of West Penn Power Co is quite right. Reddy Kilowatt did pioneer the slogan, "Servant's Entrance." But the American Cyanamid Co advertisement applied the term to the service connection and not to an outlet in the home. This usage was new.

Benefit All the People

To the Editor:

Many people have endeavored to express in words the basic philosophy of natural resource development by free enterprise. They have invariably fallen short in one way or another.

Your editorial, "The One Way to Benefit All the People", in your June 1st issue is the most clear cut and understandable statement on the issue which I have had the privilege to read. You are to be commended for so concisely putting into words the fundamental principles, not only of free enterprise in the utility industry, but also the basic concepts under which our country has prospered.

I hope this editorial receives widespread circulation both within and without the industry.

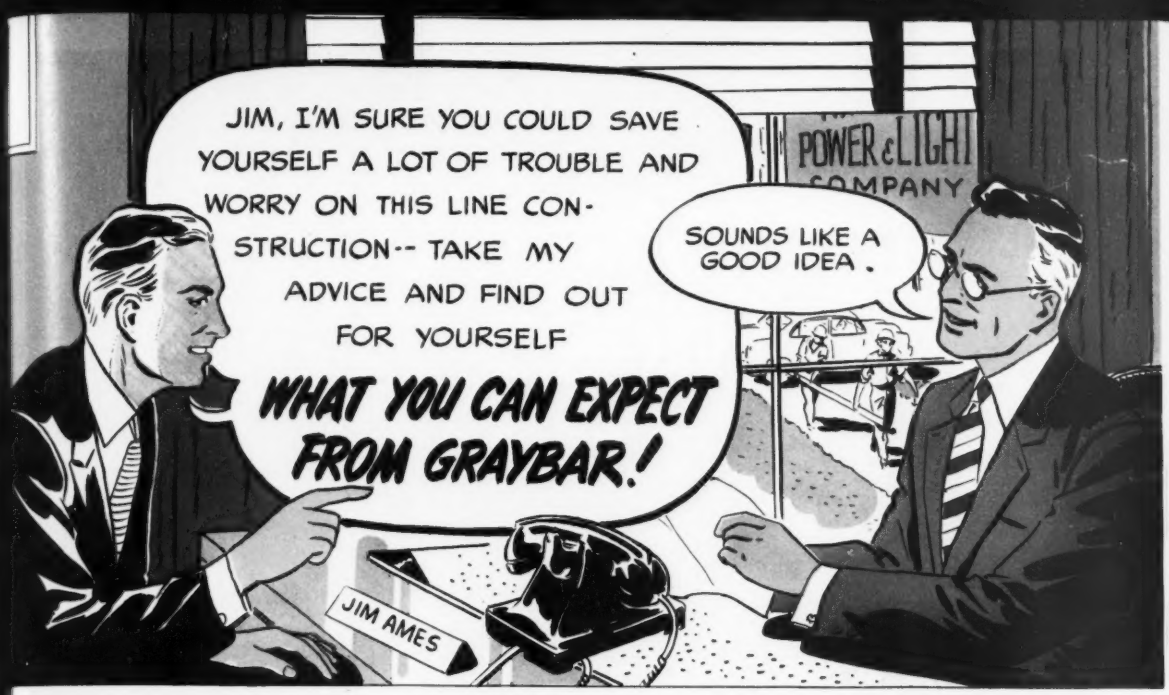
William A. Lyons
Vice President
New York State Electric & Gas Corp
Binghamton, New York

Joy At Highlandtown

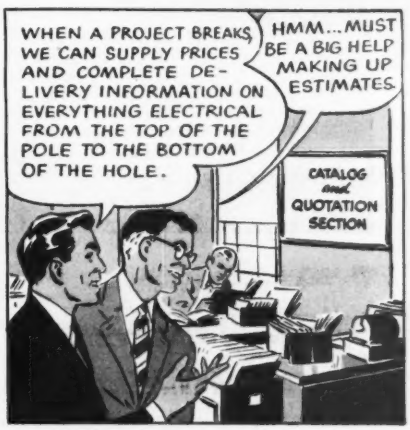
To the Editor:

I understand that the arrival of your May 18, 1953 issue of Electrical World (Motorized Rotary Drill Saves 95% Time in Drilling Concrete —pg 176) created quite a bit of excitement at our Highlandtown Substation. Particularly pleased, of course, was Jim Byers. A modest individual, he was unusually pleased to have made the columns of Electrical World.

William B. Crane
Public Relations Department
Pennsylvania Water & Power Co
Baltimore, Md.


JIM, I'M SURE YOU COULD SAVE YOURSELF A LOT OF TROUBLE AND WORRY ON THIS LINE CONSTRUCTION -- TAKE MY ADVICE AND FIND OUT FOR YOURSELF
WHAT YOU CAN EXPECT FROM GRAYBAR!
SOUNDS LIKE A GOOD IDEA.
POWER & LIGHT COMPANY
JIM AMES

YOU SEE, GRAYBAR'S KNOW-HOW IN SERVING THE ELECTRICAL INDUSTRY GOES BACK 84 YEARS -- TAKE OUR CATALOG AND QUOTATION SECTION, FOR INSTANCE...


WHEN A PROJECT BREAKS, WE CAN SUPPLY PRICES AND COMPLETE DELIVERY INFORMATION ON EVERYTHING ELECTRICAL FROM THE TOP OF THE POLE TO THE BOTTOM OF THE HOLE.
HMM... MUST BE A BIG HELP MAKING UP ESTIMATES.
CATALOG and QUOTATION SECTION

RAYBAR'S A NATION-WIDE OUTFIT ITH OFFICES AND WAREHOUSES IN 9 CITIES. IF AN ITEM HAPPENS TO E OUT OF STOCK HERE, WE CAN SUALLY GET IT ON SHORT NOTICE ROM A WAREHOUSE NEARBY.

FOR EMERGENCY PICK-UP ORDERS, USE THIS HANDY COUNTER SERVICE. OUR EXPERIENCED COUNTER SALESMEN WILL GIVE PROMPT ON-THE-SPOT SERVICE.

NOW... LETS TAKE A WALK THROUGH THE WAREHOUSE. YOU'LL SEE OUR COMPLETE STOCKS OF CONSTRUCTION TOOLS AND UTILITY STANDARD ITEMS.
WAREHOUSE

L GRAYBAR FIRST FOR EVERYTHING ELECTRICAL

Graybar Everything Electrical Graybar Electric Company

THE ADVANTAGES OF

FLAT BAR

BUS CONDUCTORS

For heavy direct currents, the capacities of multi-bar busses are theoretically unlimited if adequate copper section and ventilation are provided. Flat bars require minimum space for making connections to apparatus without special joint preparation. They may also be bent flatwise or edgewise for making connections.

A.C. flat bar busses are limited to approximately 3000 amperes at 60 cycles due to unevenness of current distribution unless intricate physical locations and transpositions of the bars are employed.

There is a complete line of ANACONDA Copper Bus Conductor designs for every type of installation and power requirement. Write today for your copy of "ANACONDA Copper Bus Conductors" containing illustrations and detailed technical information concerning designs and arrangements for bus conductors. The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

carry the load with ANACONDA® Bus Conductors

ANGLE SQUARE

CABLE

CHANNEL

ROUND TUBE

SQUARE TUBE

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

Distributed by GRAYBAR

4 REASONS WHY RAINIER CROSSARMS belong in YOUR pole-line program

1 **SELECTION** — Extra value in crossarms, as in many other quality products is the end result of *planned manufacture*. With American Crossarm and Conduit Company, careful selection of timber for manufacture of Rainier crossarms is the first important step.

2 **KILN DRYING** — Rainier kiln drying is superior because of scientific control during the seasoning period — correct temperature and the right humidity all the time while in the kiln means all fungus growth killed—timber seasoned throughout.

3 **SEASONING**—Rainier air seasoned crossarms are also carefully seasoned by control of air circulation and by the location of the seasoning sheds, as well as proper piling of the timber during the drying period.

4 **STOCKS** — The American Crossarm and Conduit Company, manufacturers of Rainier crossarms, through Graybar offer the careful buyer of crossarms an additional service — stocks at strategic locations. For planned-ahead buying or for emergencies, this fact is your assurance of lower shipping costs — quicker service.

Remember! A crossarm produced from improperly or carelessly processed timber might cost less at the time of purchase, but it certainly *is not cheaper per year of life service.*

For further information on crossarms that may pay you dividends in lowered maintenance and replacement costs, write or phone your nearby Graybar Line Construction Specialist. Graybar is located in over 100 principal cities.

AMERICAN · CROSSARM AND CONDUIT COMPANY

RAINIER WOOD PRODUCTS TRADE MARK

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

Distributed by GRAYBAR

"TOM: — IN THE FIRST YEAR AFTER WE CHANGED OUR PLANT TO FUSETRON FUSES, WE ENTIRELY ELIMINATED MOTOR BURNOUTS FROM SINGLE PHASING AND REDUCED ALL MOTOR BURNOUT BY AT LEAST 75%"

(Excerpt from a conversation of Forrest Baumgardner with Tom Wier)

FORREST BAUMGARDNER, *Chief Electrician*,
Frank Wheatley Pump & Valve Mfr.
Tulsa, Oklahoma.

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

GTE Sylvania Distributed by Graybar Electric Company

"FOREST:— DON'T FORGET FUSETRON FUSES DO MORE THAN PROTECT MOTORS THEY PROVIDE 10 POINT PROTECTION!"

1 Protect against short-circuits.*

2 Protect against needless blows caused by harmless overloads.

3 Protect against needless blows caused by excessive heating — lesser resistance results in much cooler operation.

4 Provide thermal protection — for panels and switches against damage from heating due to poor contact.

5 Protect motors against burnout from overloading.

6 Protect motors against burnout due to single phasing.

7 Give DOUBLE burnout protection to large motors — without extra cost.

8 Make protection of small motors simple and inexpensive.

9 Protect against waste of space and money — permit use of proper size switches and panels.

10 Protect coils, transformers and solenoids against burnout.

* Fusetron Fuses have high interrupting capacity as shown by tests of the Electrical Testing Laboratories of New York.

TOM WIER,
BUSS Fuseman,
covering Tulsa, Okla.

Here's why FUSETRON Fuses give All Purpose protection...

A fuse link combined with a thermal cutout — the result, a fuse with tremendous time-lag and much less electrical resistance.

They have the same degree of Underwriters Laboratories approval for both motor-running and circuit protection as the most expensive devices made.

Made to same dimensions as ordinary fuses, FUSETRON FUSES fit all standard fuse holders.

Obtainable in all sizes from 1/10 to 600 ampere, both 250 and 600 volt types. Also in plug types for 125 volt circuits.

Their cost is surprisingly low.

FUSETRON is a trade mark of the Bussmann Mfg. Co.

Don't Risk Losses!

One **lost** motor...
One **needless** shutdown...
One **destroyed** switch or panel
One **burned out** solenoid...

May cost you far more than replacing every ordinary fuse with a Fusetron dual-element Fuse.

Bussmann Mfg. Co., University at Jefferson, St. Louis 7, Mo. (Division of McGraw Electric Co.)

Please send me complete facts about FUSETRON dual-element Fuses.

Name_____

Title_____

Company _____

Address _____

City & Zone_____ State____ EW-6-53

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

Distributed by GraybaR

"American Brand" PURE MANILA ROPE

The hardest usage in all climates and under all conditions has proved this rope to be unsurpassed for durability.

Choice manila fiber and an exclusive waterproofing solution are combined to produce a rope that is completely dependable on the toughest jobs. "American Brand" rope is available in all sizes and constructions.

American Manufacturing Company, Brooklyn 22, N. Y.

Rope (Manila, Sisal, Jute, Nylon, Polyethelene, Saran, Glass), Twine, Oakum, Packing, Baler Twine, Carpet and Electrical Yarns

Branch Factories:

ST. LOUIS CORDAGE MILLS, St. Louis 4, Mo. • DELAWARE RIVER JUTE MILLS, Philadelphia, Pa.

SALES OFFICES: BOSTON • CHICAGO • HOUSTON • NEW ORLEANS • PHILADELPHIA • SAN FRANCISCO

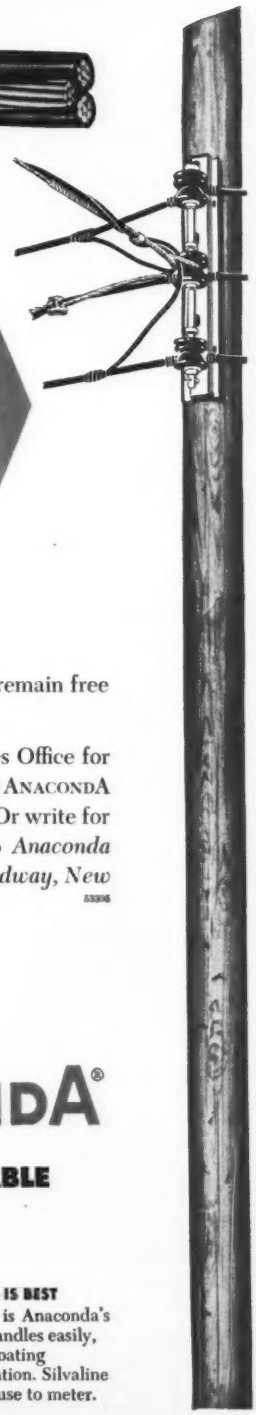
HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

Distributed by GraybaR

ANACONDA Type N-SD

Service Drop Cable with copper or aluminum conductors

YOUR CHOICE OF INSULATIONS:
neoprene
polyethylene



overall cost is lowered

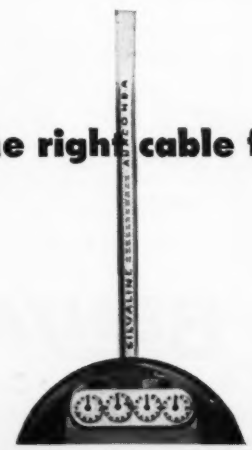
from pole

to weatherhead

TO HELP CUT THE COST of service connections, Anaconda now offers an outstanding service drop cable. This ANACONDA Cable is highly dependable . . . durable . . . and extremely weather-resistant.

TWO INSULATED CONDUCTORS are wrapped around a bare neutral messenger so that the full support of the assembly is borne by the messenger wire. The conductors remain free of tension.

ASK YOUR NEAREST Anaconda Sales Office for full information on this up-to-date ANACONDA Type N-SD Service Drop Cable. Or write for descriptive Bulletin DM-5121 to *Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.* 53304



the right cable for the job ANACONDA®

WIRE AND CABLE

FROM WEATHERHEAD TO METER, SILVALINE IS BEST
Weatherproof Silvaline* (URC Type SE) is Anaconda's completely new service entrance cable. It handles easily, offers long service life, and its silver finish coating may be painted without danger of discoloration. Silvaline is approved for installation from pole to house to meter.
*Trademark

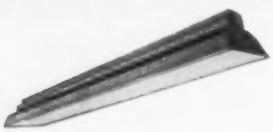
HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

lighting problems SOLVED for every plant location with a specific Benjamin U

THIS CHECK CHART OF BENJAMIN LIGHTING UNITS

shows how lighting can be matched to every seeing task in the plant!

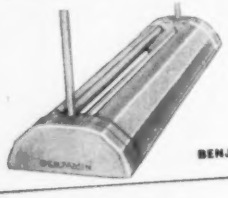
☐ **1.** fluorescent lighting of **GENERAL PLANT AREAS**



Over 300 combinations for matched-to-the-task lighting. Just three channel sizes and four types of reflectors form the backbone of an almost unlimited number of lighting systems for general industrial seeing tasks. Features utilization of high-light-output T12 Slimline lamps and exclusive "Springlox" Lampholders for lower maintenance cost through quicker lamp servicing.

BENJAMIN "Magna-Flo" Systems *described in Manual #1*

☐ **2.** fluorescent lighting to overcome **EXCESSIVE BRIGHTNESS RATIOS**



A new high in seeing comfort for industry! "Task-Master" combines greater upward flow of light with a new high of 35° lamp shielding. Revolutionary new, easier methods of installation and maintenance keep operating and maintenance costs at an all-time low.

BENJAMIN "Task-Master" *described in Manual #2*

☐ **3.** lighting of **HIGH BAYS**

A rugged lighting unit for steel mills, foundries, sheet metal works, and other locations where the lighting units must be guarded against damage from rough handling, flying metal particles, severe mechanical strain or unfavorable atmospheric conditions.

BENJAMIN "Steelite" *described in Manual #3*

☐ **4.** incandescent lighting of **GENERAL PLANT AREAS**

This unit inexpensively matches a variety of general seeing tasks; also for stairways, materials handling areas, etc. Exclusive "Turnlox" detachable reflector cuts time required for cleaning and relamping.

BENJAMIN "Turnlox" Dome Reflector *described in Manual #4*

☐ **5.** lighting for **BINS and SHELVES**

A reflector of unique design, combining uniformity of illumination with careful shielding. Uniformly lights top-to-bottom of shelves, bin tiers in stock rooms, tool cribs and book stacks. Especially adapted for the low mounting heights and narrow aisles of such locations.

BENJAMIN "Stock-Bin-Lite" Reflector *described in Manual #5*

☐ **6.** safe lighting for **HAZARDOUS LOCATIONS**

For locations listed by U.L. as Class I Groups C and D. Recommended for areas where explosive atmospheres or inflammable dust is found. Available in a choice of four reflectors and a variety of mountings. Especially constructed to withstand the tremendous pressure of internal lamp explosion.

BENJAMIN "Explosion-Proof" Units *described in Manual #6*

☐ **7.** approved lighting for **HUMID LOCATIONS**

Listed "Vapor-Tight" by U.L. Suitable for use in locations exposed to moisture or non-combustible dust, corrosive fumes, vapors, dust and smoke. Rugged construction, unbroken surface of Porcelain Enamel and heavy-gauge steel assure long life without breakdown or frequent servicing.

BENJAMIN "Vapor-Tight" Units *described in Manual #7*

☐ **8.** proper floodlighting for **OUTDOOR INDUSTRIAL AREAS**

The ideal all-weather unit for industrial, recreational areas, ball fields, pools, etc. Highest quality outdoor illumination due to combination of large diffusing Porcelain-Enameled Steel Reflector with inner aluminum reflector.

BENJAMIN "Play Area" Floodlight *described in Manual #8*

GET THESE FREE LIGHTING MANUALS!

BENJAMIN ELECTRIC MFG. CO., Dept. K, DES PLAINES, ILLINOIS

Without cost or obligation, please send me the Benjamin Manuals on the following subjects, listed in the Check Chart above:

1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐

NAME AND TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

BENJAMIN

Lighting Equipment

sold exclusively through electrical distributors

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

Distributed by GRAYBAR

users prefer COFFING HOISTS

. . . for multiplying manpower

Wherever a load must be lifted, pulled, skidded, stretched, moved, or bound, there is a right Coffing Hoist to take over the heavy work, speed the job, and in many cases, enable one man to replace a crew.

. . . increased safety

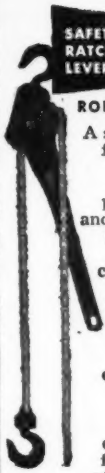
You can depend on Coffing Hoists to protect men and equipment. Each is designed and built to operate efficiently at full rated capacity with a wide margin of safety.

. . . saved maintenance costs

Coffing Hoists stay on the job longer because they require less maintenance attention. Prompt Coffing service and immediate shipment of replacement parts further reduces delays and down time. Down-time costs saved and repair costs saved are profits earned.

QUIK-LIFT ELECTRIC HOISTS

Ruggedly built for the most continuous assembly line use. For long life, all moving parts are sealed, running in oil. For safety, parts are tested at 100% overload. Seventeen models — 500 to 4000-lb. capacities.



SAFETY-PULL RATCHET LEVER HOISTS

ROLLER CHAIN

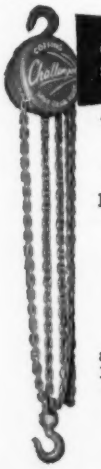
A safe, sure lift for any load. Multiplies manpower, protects men and equipment. Dual ratchet and pawl cannot slip or drop load. Safety valve handle eliminates overload dangers. Ten models — 1,500- to 30,000-lb. capacities . . . factory-tested at 100 percent overload.

COIL CHAIN

The new Model R Ratchet Lever Hoist features Coffing's time-proved Safety-Pull ratchet-pawl construction — plus coil chain for extra flexibility. Chain wraps in any direction . . . resists rust and corrosion. For ease of servicing, the Model R may be completely disassembled in seconds with only a screw driver. For safety, each unit is tested at 100 percent overload. Two models—1,500- and 3,000-lb. capacities.

HOIST-ALL

A handy all-around tool for hoisting, lifting, pulling. Without its stand, it is an efficient hoist, puller, or load binder. With stand, it becomes a powerful high-lift jack. Two sizes — 2,000 and 4,000-lb. capacities.



CHALLENGER SPUR GEAR HOISTS

All-steel, yet weighs only 39½ lb. Housing does not crack under impact. Back plate is laminated for greater rigidity. Permits minute load adjustment. Hoist can be completely disassembled in minutes with ordinary tools. Capacities, ½-, 1- and 2-ton all tested at 100 percent overload, safety factor of five. For heavy duty, *Model YC* ball-bearing hoists — Seven sizes, ½- to 5-ton capacities. *Model YCT* — Timken-bearing hoists. Fifteen sizes, ¼ to 25 tons.

MIGHTY-MIDGET PULLERS

Big pulling power in a small package. Light, compact, a Mighty-Midget hangs easily on a tool belt. Handle can be used either as a lever or a high-speed crank. Two sizes — 500-lb. model weighs only 6½ lb., 1,000-lb. model weighs only 9½ lb.

HOIST-BINDER

Ratchet hoist principle allows continuous take-up without releasing hook for new grab. Handle may be removed, making binder a tamper-proof lock. Weighs only 10 lb., exerts 3,000-lb. pull.

SAFETY LOAD BINDERS

Dual ratchet and pawl hold securely. Handle cannot fly up when released. Two models — 3,000- and 6,000-lb. capacities.

I-BEAM TROLLEYS

Plain or geared types. Capacities up to 10 tons.

COFFING HOIST COMPANY

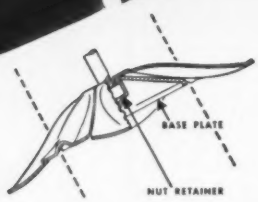
Danville, Illinois Dept. E

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

Graybar Distributed by Graybar

Tip for better anchoring . . .

Build lines to stay with the CHANCE 8-Way!



Not two... Not four... but EIGHT blades

for better load distribution

This unique all-steel expanding anchor gives you "TWO four-way anchors in ONE"—Eight blades that expand into undisturbed earth *all the way around* the hole, to give more complete load distribution than any other type of expanding anchor. There is no wasted area between blades.

The Chance 8-way is extremely simple in construction. It has no expanding arms or mechanical moving parts to jam or bind during expansion. There are no bolts to cut—the holding wires shear with a single blow of the expanding bar. The eight ribbed blades cut quickly into the solid earth and expand to form a cone-shaped square.

These are reasons why Chance 8-way Anchors are preferred by many large companies who thoroughly test and prove to themselves before they buy. Another big reason is the low price of the Chance 8-way that helps to answer the problem of constantly rising line construction costs.

Get full information today—consult your Chance Catalog—compare the features, compare the costs —order from your regular supplier.

Chance 8-way Anchors are available in a complete range of sizes from 60 to 200 square inches in area for distribution or transmission line guying.

You know it's RIGHT when you specify CHANCE

ABC INDUSTRIES

A·B·CHANCE CO·

CENTRALIA, MISSOURI
SAN FRANCISCO, CALIFORNIA

ANCHORS • GUYING FIXTURES • LINE CONSTRUCTION TOOLS • CONDUCTOR CLAMPS
GROUNDING EQUIPMENT • HOT LINE TOOLS • HIGH VOLTAGE SWITCHES • CUTOUTS

A COMPLETE LINE

Whatever your guying requirement may be, there's a Chance Anchor that will do the job most efficiently.
The Graybar man in your area can give you complete information to help you select and order the Chance Anchors best suited to your requirements.

C52-15

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

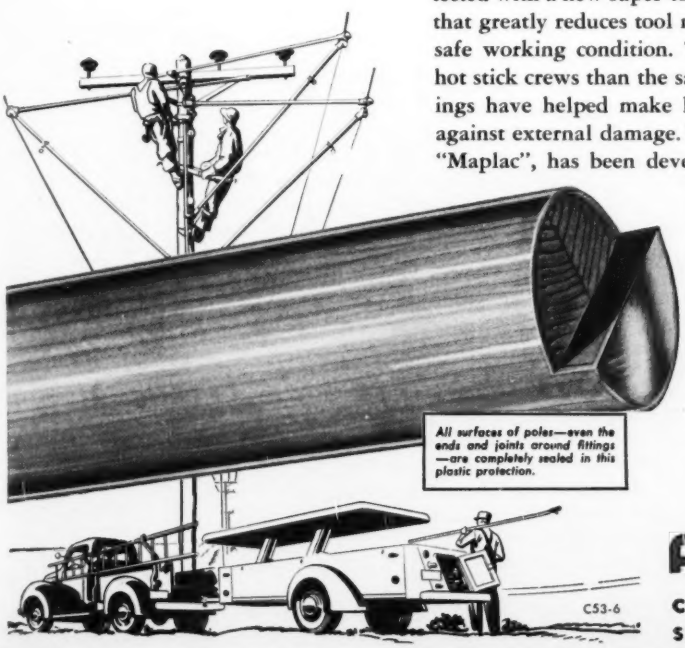
Distributed by Graybar

Aluminum General Purpose Hot Line Clamps

These new aluminum-body tap clamps can be used for all types of connections: copper to copper, copper to aluminum, aluminum to aluminum, and aluminum to copper. This is made possible through the development of a successful method of coating the light weight aluminum bodies with a high-density, fortified cadmium which wards off corrosion and electrolysis in all types of connections. The use of Chance Aluminum General Purpose Clamps eliminates the possibility of error in connector applications and simplifies inventory. They are available in two types: The P. C. (Protected Connection) Clamp and the Perma-Grip Clamp.

Plastic-Protected Hot Line Tools

cut tool maintenance costs



Chance lightweight, aluminum-fitted Hot Line Tools are protected with a new super-tough plastic finish called MAPLAC® that greatly reduces tool maintenance and helps keep tools in safe working condition. There's nothing more important to hot stick crews than the safety of their tools—and plastic coatings have helped make hot sticks safer by protecting them against external damage. The Chance Hot Line Tool coating, "Maplac", has been developed jointly by Chance Engineers and our plastics supplier, providing a clear, tough finish that boasts these features: TOUGHNESS, TRANSPARENCY, MECHANICAL STRENGTH, TEMPERATURE RESISTANCE, MOISTURE RESISTANCE, ELECTRICAL RESISTIVITY, and REPAIRABILITY. Furthermore, you pay no premium price for these premium Hot Line Tools.

A·B·CHANCE CO·

CENTRALIA, MISSOURI
SAN FRANCISCO, CALIFORNIA

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

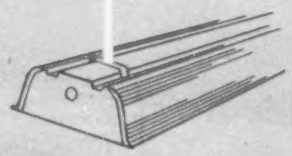
Distributed by GraybaR

CURTIS 6000 INDUSTRIAL SERIES

The New Curtis "Six Thousand" series is designed for Eye-Comfort® in industrial locations. The Luminaires illuminate the ceiling with an indirect component of 25% of the light output. Crosswise shielding of 35° is provided for the 75% direct component. The lighting units in this versatile line are available with Alzak Aluminum, Porcelain Enamel, or baked white "Fluracite" enamel removable side reflectors. Low cost efficient maintenance is provided by having side panels readily removable for cleaning. In addition there are no horizontal diffusing or reflecting surfaces to collect dust. There is a unit in this versatile line to accommodate all 4', 5' and 8' fluorescent lamps. The Curtis "Six-Thousand" series brings Appropriate Brightness Control Lighting to industrial areas.

Curtis "Tong Hangers*" facilitate and cut installation cost as they allow flexibility in placement of hangers and permit by-passing of building construction obstacles such as beams, sprinkler heads, etc.

*Pat. applied for.



CURTIS LIGHTING, INC.

6135 WEST 65TH STREET, CHICAGO 38, ILLINOIS

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

Distributed by GraybaR

UTILITY LIFTING JOBS MADE *QUICK AND EASY* WITH DUFF-NORTON JACKS

Duff-Norton Jacks save unlimited time, effort and money for light, power, street railway, railroad, telephone and telegraph companies, in maintenance of pipe lines, track, poles, bridges, heavy equipment, etc. There's a Duff-Norton Jack for every utility application. Write for data and proposal on these dependable jacks for your requirements.

CABLE REEL *Jacks*

Duff-Norton Cable Reel Jacks are standard with utility companies for lifting and holding heavy cable reels, because they meet the most exacting demands of utility crews under most adverse field conditions. Weather-proof, non-rocking, they provide rapid, even lifting and lowering.

Specifications				
Jack No.	Capacity Tons	Height Inches	Raise Inches	Weight Pounds
1030-CR	10	30	14	110

Other reel jacks are available with multiple hooks, for handling reels of varying diameters and weights.

POLE PULLING *Jacks*

Duff-Norton Pole Pulling Jacks pull or straighten utility poles without laborious digging. Hinged channel base permits jack operation at an angle or in upright position as required. "Service" need not be interrupted when these jacks are used.

Specifications					
Jack No.	Capacity Tons	Height Inches	Raise Inches	Base Inches	Weight Pounds
529	5	28	18	7x16	91
500	15	37½	23	10x24	250

These Duff-Norton Jacks

SAVE UTILITIES TIME • ENERGY • MONEY

- **TRENCH BRACES**
- **HYDRAULIC JACKS**
- **AUTOMATIC LOWERING JACKS**
- **PUSH AND PULL JACKS**
- **SCREW JACKS**
- **AIR MOTOR POWER JACKS**
- **MANY OTHERS THAT MEET EVERY UTILITY NEED**

• WRITE FOR CATALOG 203

THE DUFF-NORTON MANUFACTURING CO.

MAIN PLANT and GENERAL OFFICES, PITTSBURGH 30, PA. — CANADIAN PLANT, TORONTO, ONT.

"The House that Jacks Built"

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

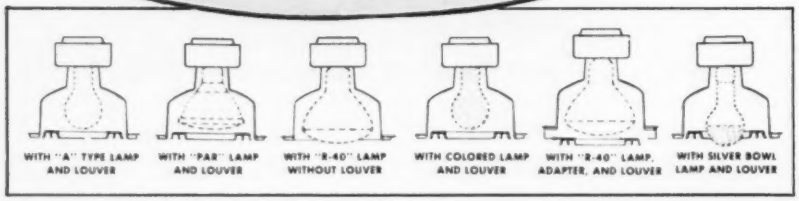
Distributed by GraybaR

DAY-BRITE
DERBY DOWNLIGHTS

No. 80141—with 6¾" diameter Controlens* in removable frame. Recommended for use with 100-watt Type "A" lamp.

*® HOLOPHANE CO.

No. R-80140—with removable matt black steel louver. For PAR-38 or Type "A" lamp to 150-watt size. Without louver for R-40 lamp, 150 to 300-watt.


WITH "A" TYPE LAMP AND LOUVER
WITH "PAR" LAMP AND LOUVER
WITH "R-40" LAMP WITHOUT LOUVER
WITH COLORED LAMP AND LOUVER
WITH "R-40" LAMP, ADAPTER, AND LOUVER
WITH SILVER BOWL LAMP AND LOUVER

FOR

Window Display
Marquees
Stores
Lobbies
Soda Fountains
Reception Rooms
Murals
Bathroom Heat Lamp
Restaurants
Canopy Lighting
Escalators
Foyers
Churches
Food Counters
Atmosphere Lighting
Bars
Display Lighting
Greeting Card Racks
Dining Rooms
Kitchens
Rathskellers

Day-Brite Derby units are low-cost, highest quality incandescent downlights. These versatile, easy-to-install recessed spots can take a lighting installation out of the ordinary class—give it sparkle and glamor—without excessive expense. And all Derby Downlights are approved by the Underwriters' Laboratories.

Ask your Day-Brite representative for full information.

"DECIDEDLY BETTER"
DAY-BRITE
Lighting Fixtures

DAY-BRITE LIGHTING, INC., 5417 BULWER AVE., ST. LOUIS 7, MISSOURI
IN CANADA: AMALGAMATED ELECTRIC CORP., LTD. TORONTO 6, ONTARIO

340

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

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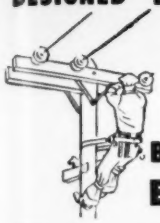
DESIGNED TO MEET YOUR NEEDS IN LINE CONSTRUCTION AND MAINTENANCE



EAGLE

Distributed by GraybaR

BODIES • TRAILERS • POLE DERRICKS • TOOLS • ACCESSORIES • EQUIPMENT

EAGLE MANUFACTURING CO. DIVISION OF THE FOUR WHEEL DRIVE AUTO CO. **Appleton, Wis.**

UTILITY BODIES—BUILT FOR YEARS OF SERVICE

Steel bodies expressly designed to save time — conserve man power — provide a place for everything. Adaptable to a wide range of uses for large and small utilities — REA's, contractors, telephone, water departments. Sliding top — optional.

Model B6: for mounting on any ½ ton truck chassis with CA dimension of approximately 38 inches. 15 separate compartments — light — compact — attractive.

Model B7: for mounting on any ¾ to 1 ton truck chassis with CA dimension ranging 48 inches to 60 inches. 26 separate compartments. Sturdy — compact — practical.

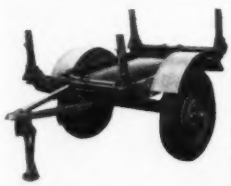
TRAILERS—IN A WIDE RANGE OF SIZES AND TYPES

ADJUSTABLE LENGTH POLE TRAILER

Easily adjusts to accommodate poles up to 90 ft. long — through telescoping center pole. Equipped with electric brakes on rear wheels. Get complete information on Eagle Trailer Model 6450.

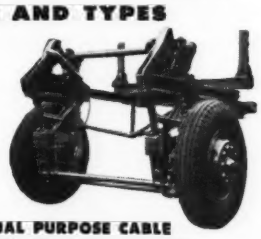
FOUR-WHEEL LO-BED TRAILER

Designed for easy loading of heavy bulky units, also suited to pole and general purpose hauling. 5 ton capacity; overall length, including tongue 25 ft. 8 inches. Get complete information on Eagle Trailer Model 6441.



ALL-PURPOSE TRAILER

Combination cargo and pole trailer. Removable fenders and sideboards; front and rear bolsters with sliding uprights; king pole binder; load binder winch and 10 ft. extension tongue. 2 to 5 ton capacity. Get complete information on Eagle P 8 T Series Trailers.



DUAL PURPOSE CABLE REEL AND POLE TRAILER

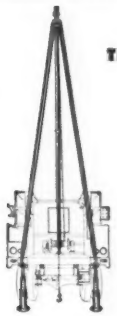
Can be used as a cable reel trailer handling reels from 34 inches to 38 inches or from 44 inches to 48 inches width; or as a pole trailer by removing saddles and installing bolsters. Get complete information on Eagle Trailer PCP W-PCP Series.

LIGHT DUTY CARGO AND GENERAL PURPOSE TRAILER

Light duty, 1 ton capacity, trailer for hauling one or two poles, cross-arms, pole hardware, etc. Has pole saddles front and rear and removable end boards. Get complete information on Eagle Trailer Model 7163.

DERRICKS

TRIPOD TYPE



available in either steel or aluminum construction for mounting on truck chassis.

T-TYPE

designed for use with a double drum winch.

Get complete information on Eagle Pole Derricks Types M-40, M-45, M-2870, T-45

SURE BINDER

The handiest time-saving tool ever developed for binding logs, poles, and bulky loads to trailer or truck. Get complete information on the Eagle Sure Binder.

HEAVY-DUTY DRAWBAR

For heavy duty use with pole trailers of 3 to 5 tons capacity. Equipped with coupling eyes to fit standard pintle or towing hook. Get complete information on Eagle Heavy Duty Drawbar H.

COLLAPSIBLE REEL

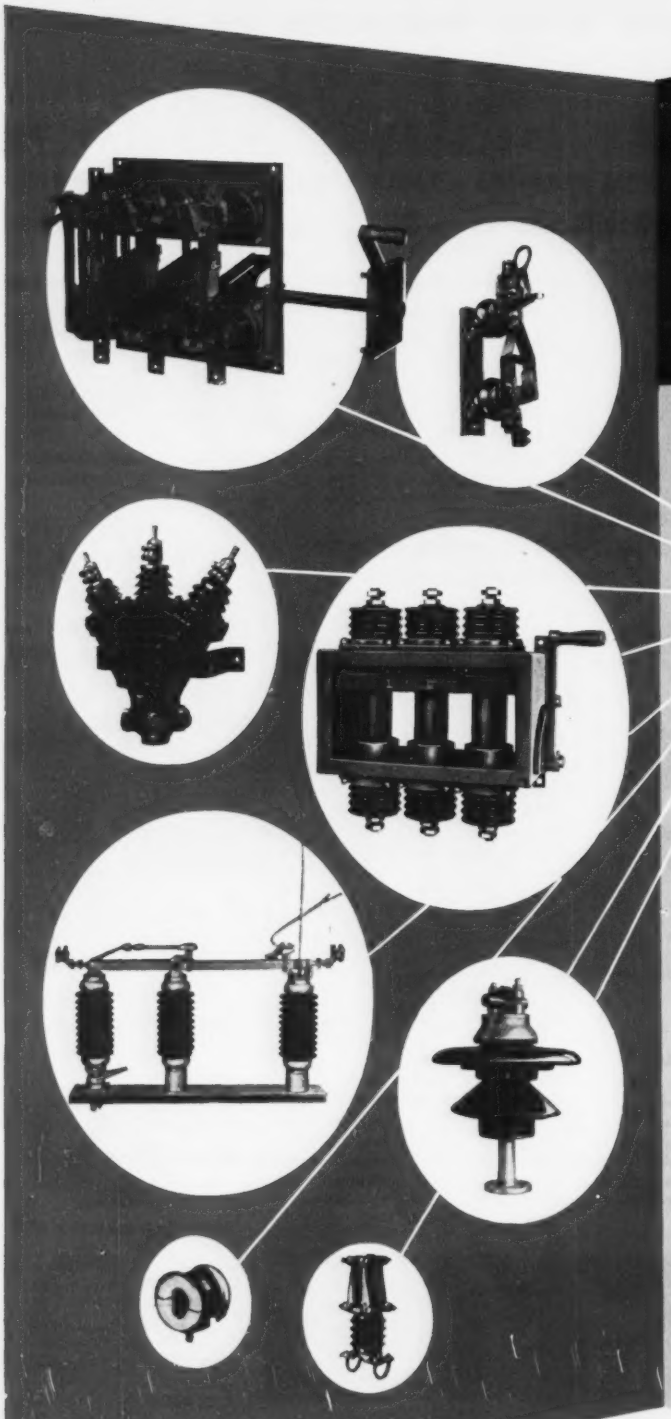
Reels up wire quickly and neatly. Attaches to winch shaft. Easy removal of coiled wire by collapsing holding arms of reel. Weight only 75 lbs; made of aluminum alloy and steel. Get complete information on Type CR Collapsible Reel.

SEND FOR COMPLETE CATALOG

Items shown are only a part of the wide range of line construction and maintenance equipment, tools, accessories built by Eagle. Send today for the complete catalog — a useful reference book.

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

Distributed by GraybaR



3E

High Voltage Protection with

DISCONNECTS
INTERRUPTER SWITCHES
POTHEADS
ISOLATORS
AIR BRAKE SWITCHES
CLAMP INSULATOR SUPPORTS
INDOOR BUS SUPPORTS
OUTDOOR BUS SUPPORTS

SELECT WITH CARE ...
... USE WITH CONFIDENCE

More and more electrified industrial plants are being served from high voltage lines. To help guard against service interruptions, high voltage switchgear and accessories that protect the flow of power should be selected with utmost care.

One way to assure trouble free operation on your equipment is to SPECIFY THREE E.

THREE E high voltage switchgear and allied products are soundly engineered, built of high grade materials, with a "know how" accumulated in more than forty years of painstaking manufacture.

THREE E

ELECTRICAL ENGINEERS EQUIPMENT CO.
MELROSE PARK, ILLINOIS

Illustrated bulletins available

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

Distributed by Graybar

EVERSTICK ANCHORS

FOR TOUGH ANCHORING JOBS!

Today's anchoring jobs bring Eversticks to the forefront. They provide tight, safe anchoring . . . always in excess of rated capacities. Easy and quick to install . . . made of finest grade malleable iron with superior rust-resisting qualities and exceptional toughness. Every Everstick is plainly marked for ease of handling and storing.

The nut housing feature of the Everstick prevents rod from slipping thru while installing and provides a solid substantial base for the expanding blades.

There's a complete line of Eversticks for all strain requirements. 15 sizes of 2-way—3-way—4-way types.

EVERSTICK ANCHOR CO., Fairfield, Iowa

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

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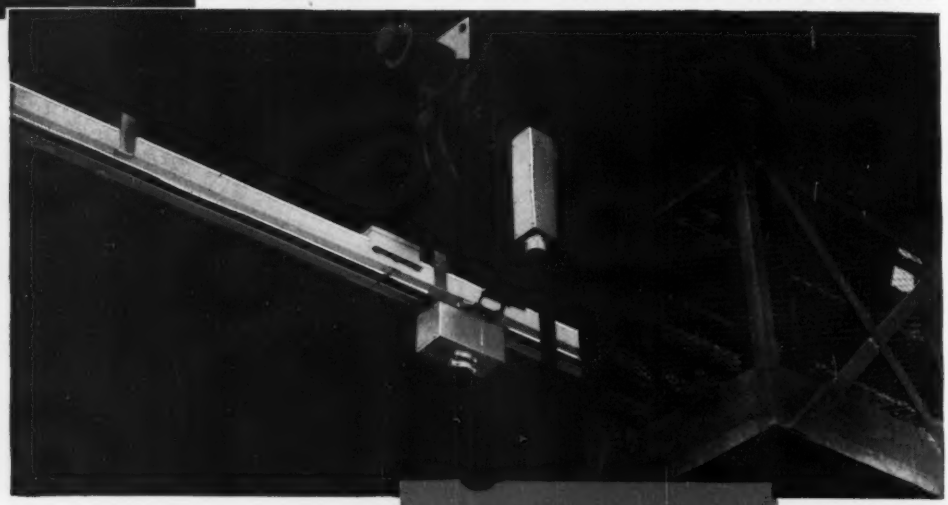
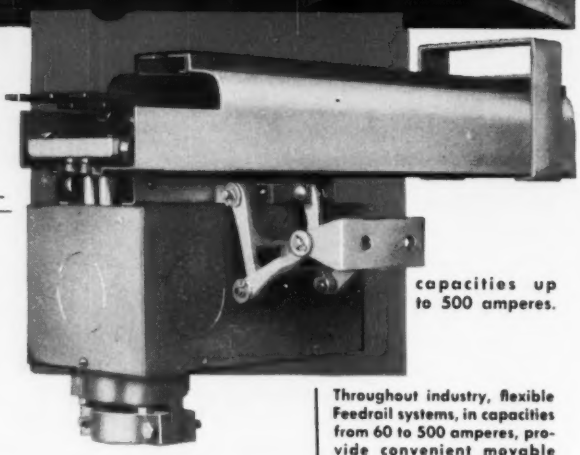
safe electrification for HEAVY DUTY CRANES and HOISTS



FEEDRAIL® Moving POWER SYSTEMS



capacities up to 500 amperes.

No longer need your Crane and Hoist wiring endanger workers or be a potential fire hazard to your plant. The new Heavy Duty Feedrail trolley busways give you the *safe* way because:

1 **They are a built-for-the-purpose system, designed and constructed *expressly* for high amperages.**

2 **All current carrying conductors and trolley contacts are protected every inch of the way.**

But, maximum safety is only one advantage you get from Heavy Duty Feedrail. The system — accurately, ruggedly constructed — fits into your specific application requirements, its standardized components making for an easy installation. And, you'll find its low maintenance, long life and continuous dependable service are economy factors in plant operation.

write for HEAVY DUTY Catalog No. 30.

Tells you all about this new Heavy Duty system of electrification, including installation planning and specifying data. Like this catalog . . . engineering cooperation is always available . . . without any obligation.

SPECIALLY QUALIFIED REPRESENTATIVES IN PRINCIPAL CITIES

Throughout industry, flexible Feedrail systems, in capacities from 60 to 500 amperes, provide convenient movable power sources for production, testing and materials handling. These can serve you in:

- Cranes and Hoists
- Production Lines
- Conveyor Assembly Lines
- Moving Test Lines
- Portable Tools
- Machine Tools
- Cutting and Sewing Rooms
- Lighting
- Motor Control

Never Becomes Obsolete

FEEDRAIL CORPORATION

Subsidiary of Russell & Stoll Company, Inc.

125 Barclay Street, New York 7, N. Y.

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HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

GRAYBAR

TEAMED UP FOR SERVICE...

Only a complete line of the best that engineering experience and performance can produce is adequate to meet the demands of our customers. This means, every company on our team must maintain manufacturing standards of the highest order. Such has been the achievement of General Cable—whose wire and cable products have always provided outstanding quality and performance.

- BARE WIRES AND CABLES
- OK*—PEERLESS*—TIP-TOP* WEATHERPROOF WIRES
- GUARDIAN* BUILDING WIRES AND CABLES—THERMOPLASTIC AND RUBBER INSULATED
- ROMEX*, ROMEX-G AND ROMEX-N NON-METALLIC SHEATHED CABLES
- VARNISHED CAMBRIC POWER AND CONTROL CABLES, THERMOPLASTIC AND THERMOSETTING JACKETED, BRAIDED, OR LEAD SHEATHED
- SUPER SERVICE AND OTHER PORTABLE CORDS AND CABLES
- SERVICE CABLES—ALL TYPES

* TRADE MARKS REG. U. S. PAT. OFF

"More Power to You"®

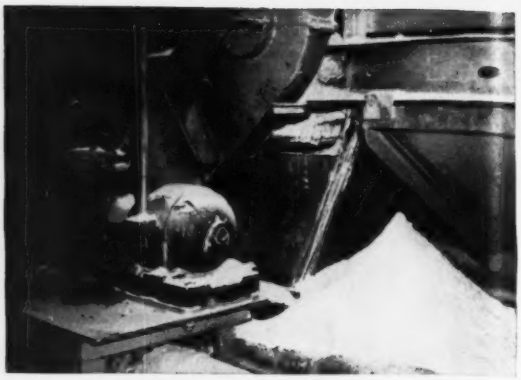
GENERAL CABLE
CORPORATION

EXECUTIVE OFFICES: 420 LEXINGTON AVENUE, NEW YORK 17, N. Y.
SALES OFFICES IN PRINCIPAL CITIES OF THE UNITED STATES

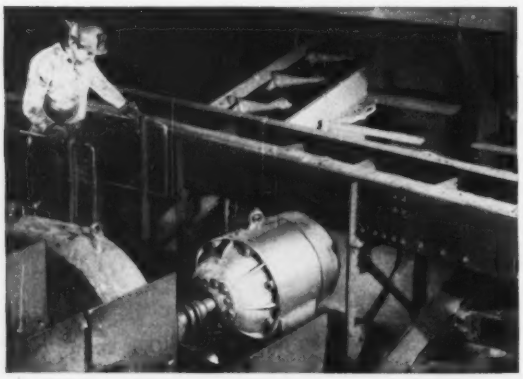
HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

Distributed by GraybaR

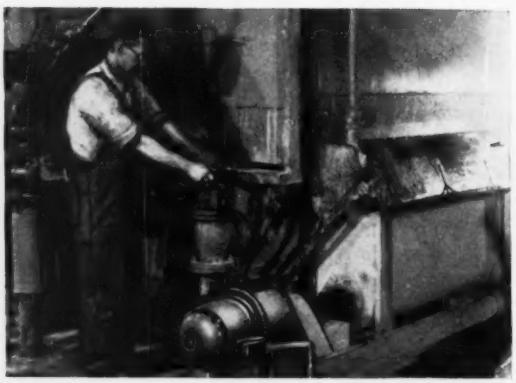
Abrasive metallic dust doesn't affect these six 7½-hp totally enclosed Tri-Clad* motors powering a metal polishing machine.



Laden with dust, this 3-hp totally enclosed non-ventilated Tri-Clad motor continues to stay on the job driving a soda ash conveyor.



Completely protected totally enclosed, fan-cooled, Tri-Clad motor has given long, continuous service without failure on this coal conveyor.



"Continuous Process" operation made possible in this beet-sugar refinery with totally enclosed Tri-Clad gear-motor driving a repulper.

Totally enclosed fan-cooled

Totally enclosed non-ventilated

G-E Motors and Control Give

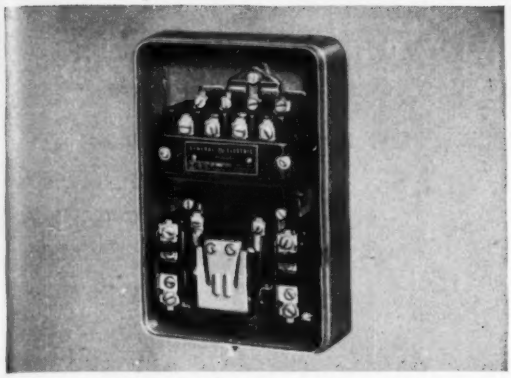
G-E TRI-CLAD TOTALLY ENCLOSED MOTORS ARE BUILT TO MEET YOUR TOUGHEST REQUIREMENTS

For applications where your machines must operate in corrosive atmospheres containing dirt, oil, or metallic dust, General Electric *standard* Tri-Clad totally enclosed induction motors have all the needed protection—built right in. That's been proved on thousands of the toughest applications throughout all industry.

These motors, housed in corrosion-resistant cast-iron frames and endshields have all the well-known Tri-Clad protective features. Frames and endshields on every motor are designed to withstand heavy blows and are well protected from accidental damage while handling, mounting, or shipping, or from falling objects. Channel and rib sections give extra strength where needed without increasing the weight. In addition, provision has been made for re-lubrication should it ever become necessary.

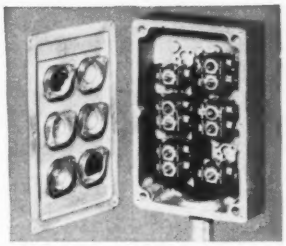
Totally enclosed fan-cooled or totally enclosed non-ventilated—both are standard "off-the-shelf" motors. That means ordering is simpler and shipment is faster. TENV motors are available in ratings from 1 to 5 hp; TEFC motors from 5 to 1000 hp.

*Reg. Trade-mark of General Electric Co.

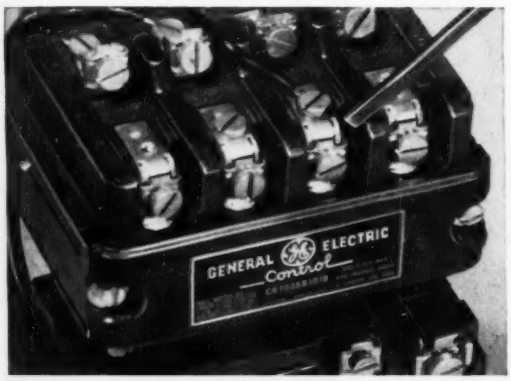


Production protection is afforded by reliable General Electric AC Motor Starters—built for longer life and easier wiring and maintenance.

NEW PUSH-BUTTON ENCLOSURES PERMIT BACK-MOUNTING UNITS, SPEED WIRING

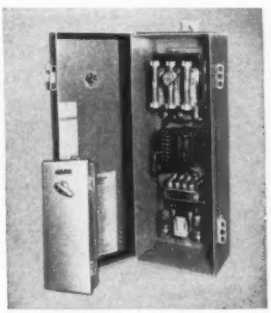


In General Electric's complete new oiltight push-button line, one of the many new features is an improved enclosure design (taking 1 to 9 units) that lets you back-mount units to simplify wiring. Contact blocks stay in place when cover is removed, permitting fast, easy connections directly to the blocks. Saves wire, too. Units can be front-mounted as well. Stations with any combination of a wide variety of units are available.



Accessible terminals make electrical connections fast, easy. Panhead screws and saddle-type connectors assure easier connections.

BUILT TO MEET JIC STANDARDS: EXTRA-PROTECTED MAGNETIC STARTERS



For use in dust- and oil-laden atmospheres, these G-E combination starters for JIC standards offer such protective features as oil-resistant door gasket, dual-voltage transformer, and exterior mounting bracket. Reversing and non-reversing types are available in sizes from 1 to 5 for 220-, 440-, and 550-volt a-c motors up to 100 hp.

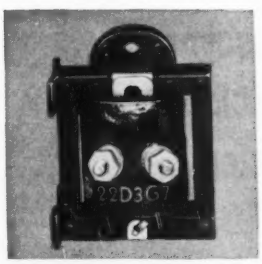
Longer Service, Need Less Upkeep

G-E AC MOTOR STARTERS BUILT FOR EXTRA LONG LIFE

Here are just a few of many features of General Electric motor starters that make them long-lasting. Fine silver contact tips plus extra-heavy contact construction spell long life. Arcs are snuffed at once by arc-resistant hood, prolonging contact life even more. Exclusive "Strongbox" magnet coil is locked in moisture-resistant plastic block to insure long coil life. These G-E starters are available in NEMA sizes 0, 1, 2, 3 for a-c motors up to 50 hp in general-purpose dust-tight, watertight, or explosion-proof enclosure

674-156

POSITIVE ACTION WITHOUT BOUNCE: HEAVY-DUTY AC OR DC SOLENOIDS



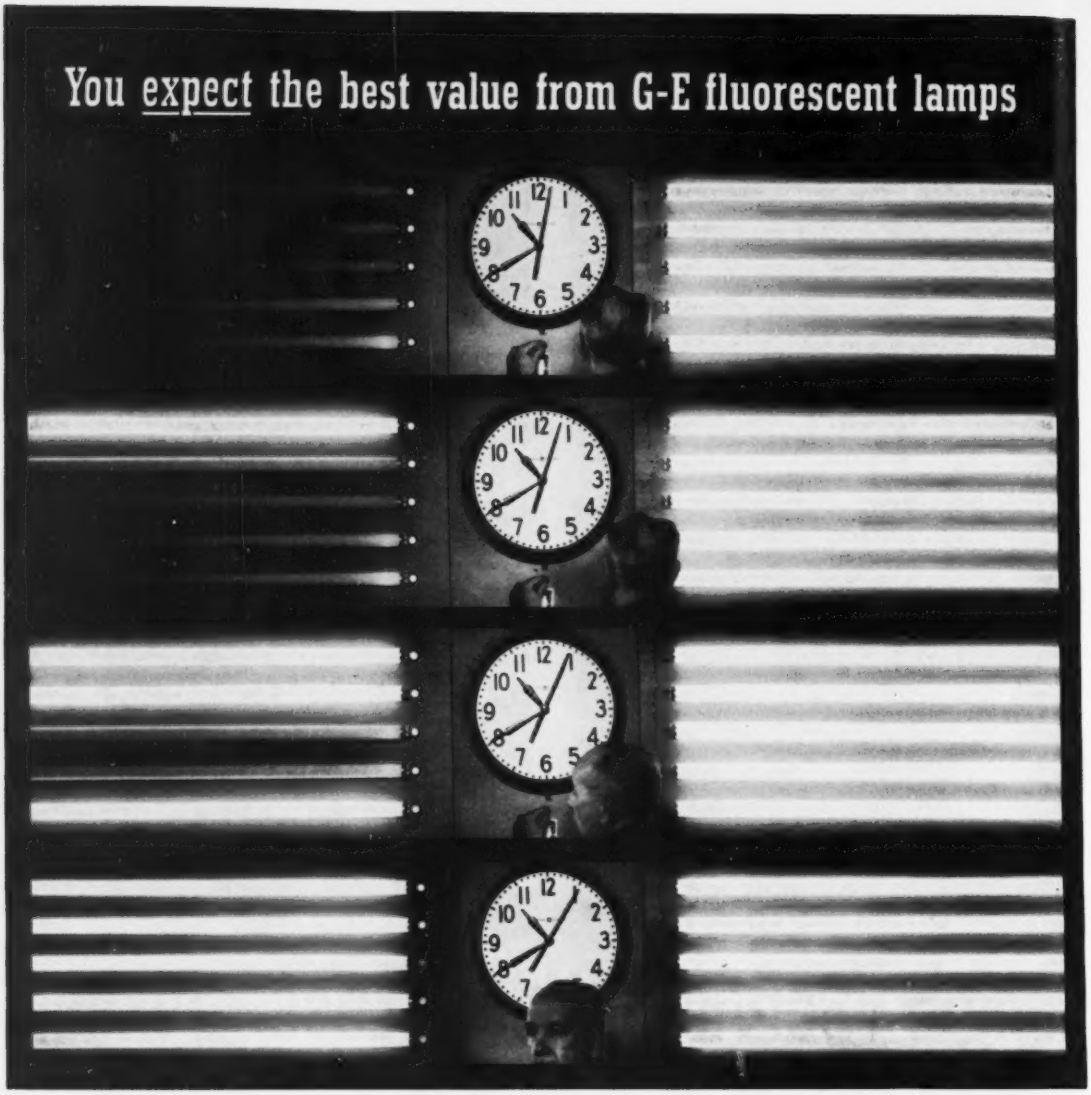
You get longer life from G-E heavy-duty a-c or d-c solenoids because laminated frame and plunger of high-grade steel are pressure-riveted. Carefully designed coils minimize possibility of grounding. Complete line includes ratings from 3/4-in. stroke at 0.65-lb. thrust to 3-in. at 97-lb.

GENERAL ELECTRIC

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

Distributed by GrayBar Electric Company

You expect the best value from G-E fluorescent lamps



New G-E fluorescent lamp starts quicker, needs no starter

1878 75 1953
YEARS OF ELECTRICAL PROGRESS
Diamond Anniversary

Watch the clock. Above are four unretouched photos taken about one second apart. On the left are regular fluorescent lamps, on the right the new General Electric *Rapid Start* fluorescent lamps. All were started at the same instant.

Within two seconds, all five G-E *Rapid Start* lamps are fully lighted. The regular lamps are only beginning to light.

Two new General Electric developments made the *Rapid Start* lamp possible: a special development of the triple coil cathode and a *Rapid Start* ballast that pre-heats the lamp automatically. No starter needed. No wait for pre-heating. Starting is almost instantaneous, maintenance simpler, cheaper.

Rapid Start lamps and ballasts are now available. You *expect* the best value from G-E fluorescent lamps. Here's one more reason why you can.

For free folder, "Facts About Rapid Start" write General Electric, Dept. 166-EW-6, Nela Park, Cleveland 12, Ohio.

You can put your confidence in —

GENERAL ELECTRIC

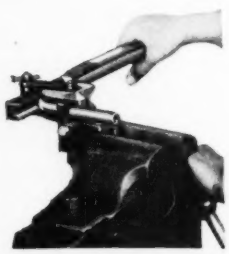
HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

Distributed by Graybar

CUT COSTS...SPEED JOBS WITH GREENLEE TIMESAVING TOOLS

Greenlee Hydraulic Conduit Bender

Conduit installations go far faster . . . neat, tailor-made jobs result every time with a GREENLEE Bender. Many owners report labor savings from 50% to 90% . . . and the cost of many manufactured bends and fittings is eliminated. For, with the GREENLEE, *one man* in but minutes makes smooth, accurate bends in pipe up to 5", rigid and thin-wall conduit, tubing and bus bars. Compact and portable, the GREENLEE Hydraulic Bender can be easily and quickly moved for *on-the-job bending* exactly where and when wanted! *Users say it often pays for itself on the very first job.*

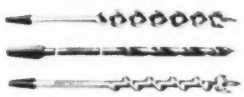


Hand Benders for Tubing

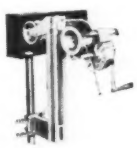
Swiftly produce accurate small-radius bends (up to 180°) in conduit, pipe and tubing. No flattening or kinks. GREENLEE Hand Benders are especially designed to form neat bends to fit sharp corners, nooks and other close quarters. Eliminates need for many manufactured bends and fittings. Various sizes and models . . . handy companion tools to GREENLEE Hydraulic Benders for quickly "custom making" your own complete conduit installations *right on the job.*

Knockout Punches and Hydraulic Punch Driver

Quick, easy way to make knockout enlargements for ½" to 4" conduit. Simply insert GREENLEE Knockout Punch in knockout or small drilled hole, then turn with an ordinary wrench. For an even faster, practically effortless operation, drive Punch with powerful, portable GREENLEE Hydraulic Driver shown below.



Boring Tools For quickly making clean, smooth openings for conduit and wiring. The GREENLEE line includes Electricians' Unispur and Solid-Center Auger Bits, Bell Hangers' Drills, Expansive Bits, and Bit Extensions.



Cable Puller Easy-operating, compact unit for 7,500 pound pull. Fastens directly to conduit for pulling in line with conduit . . . no loosened hangers. Attachment available for concealed conduit work.

SEE YOUR ELECTRICAL DISTRIBUTOR Get complete information on the above and other GREENLEE timesaving tools: Hydraulic Pipe Pushers • Joist Borers • Chisels and Gouges • Radio Chassis Punches • Angle-Screw Drivers • Spiral Screw Drivers • Automatic Push Drills • and many more. Greenlee Tool Co., 1806 Columbia Avenue, Rockford, Illinois.

TOOLS FOR CRAFTSMEN
GREENLEE

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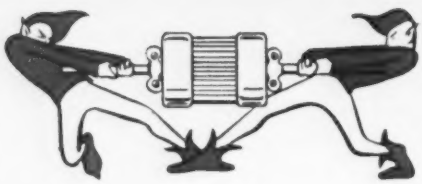
Distributed by GrayBaR

HUBBELL
originators of
Twist-Lock
CAPS AND RECEPTACLES



They Never Disconnect Accidentally!

Twist-Lock Wiring Devices are particularly desirable wherever portable, motor-driven tools and electrical apparatus are used. Twist-Lock devices eliminate time losses and annoying delays because they "stay-put" — are vibration proof — assure a lock-fast electrical connection under the most trying conditions — and give protection from shock and fire, through the use of properly polarized and grounded devices.

The unique locking principle that enables genuine Twist-Lock Devices to maintain uninterrupted electrical contact, regardless of tension or vibration, is an original Harvey Hubbell design and development. This locking principle has been an exclusive feature of the Hubbell line of electrical wiring devices for more than 23 years. In that time, Twist-Lock Devices have been so simplified and improved by Hubbell engineers that they have never been equalled.

Harvey Hubbell, Inc. has originated and pioneered many of today's standards in quality wiring devices. There have been imitators, but none can compare with Hubbell for experience, skill and craftsmanship.

Manufacturers of Quality Wiring Devices for Over 60 Years

HARVEY HUBBELL, INC. HUBBELL **BRIDGEPORT, CONN.**

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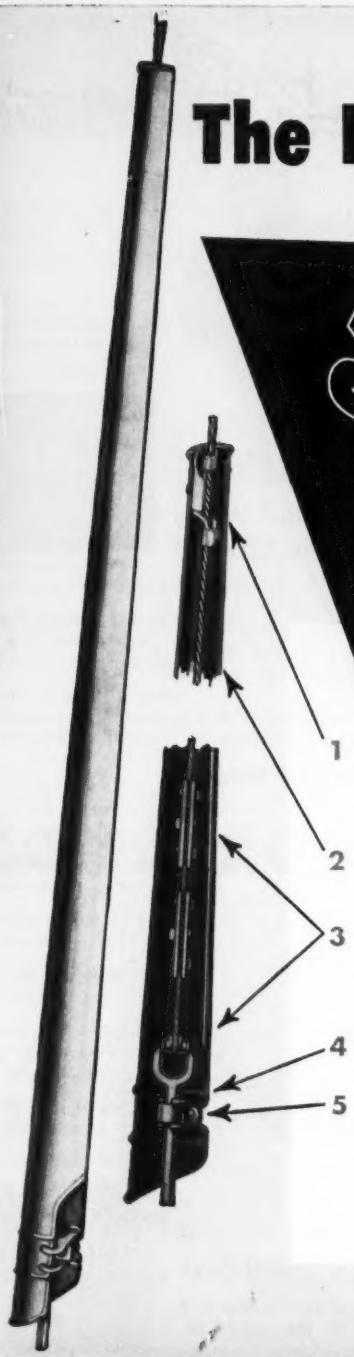
The HUBBARD LOXFAST

5 POINT Guy Protector

HOT GALVANIZED



1. Top clamp fits strands ½-inch in diameter and under, no bolts to tighten.
2. Turned edge, full length, gives rigidity.
3. Anchor rod eyes and guy clamps completely encased.
4. Beading for extra strength.
5. Clamp takes rods 1¼-inch diameter and under, one bolt action.

THERE is only one bolt to tighten when installing the Loxfast. The top clamp on the Hubbard Loxfast is boltless. It is attached first by hooking over the guy wire. A single bolt makes the bottom clamp fast around the anchor rod after the Loxfast is properly lined up. Loxfasts don't rattle in wind or storm. There's extra strength, extra appearance and economy of shipping and storing space in the tapered design. There's extra strength, too, in the turned edges and bottom beading. There's high visibility in the bright, double-dip galvanized surface; the 8-foot Loxfast exposes 360 square inches to view from a single point of vision. The Loxfast is installed in minutes, for long years of service.

HUBBARD AND COMPANY

ESTABLISHED 1845

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

"Hang the Load on Hubbard Hardware!"

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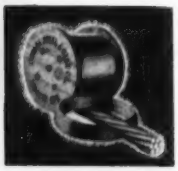
Crapo Steel Strand



For Guys, Messenger and Overhead Ground Wire, Specify Crapo Strand!

Strength, ruggedness, workability, long-life are combined — with all-important **economy** — in *Crapo* Galvanized Steel Strand.

The superior tensile strength of the steel is utilized to fullest advantage in each size and grade. The heavy, ductile, tightly-adherent galvanized zinc coating — applied by the famous *Crapo* Process — provides dependable protection for the steel, prolongs the life of the strand.

There is a size and grade of *Crapo* Galvanized Strand for every practical need. Contact the nearest Graybar house or ask the Graybar representative for further information!

INDIANA STEEL & WIRE COMPANY — MUNCIE, INDIANA

PREFORMED ARMOR RODS

Protect and Reinforce Your Conductors at Small Cost

PREFORMED ARMOR RODS provide a **simple, practical, economical** method of reinforcing and protecting overhead conductors and static wires at the point of, and in the region of, the supports.

Accurately designed and preformed to prescribed length and pitch, these spiral rods form a snug-fitting, compact, cylindrical armor over conductor or static wire. Easily and quickly installed by hand. **No clamps or clips** are required.

PREFORMED ARMOR RODS also are being used successfully to repair multi-stranded conductors and to reinforce worn conductors. Produced in Aluminum-Alloy, Galvanized and Stainless Steel, Copperweld and Copper or Bronze. Ask your Graybar representative for details!

INDIANA STEEL & WIRE COMPANY — MUNCIE, INDIANA

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The best fans...for every ventilating need...come from ILG

Engineered specifically for exhaust fan duty

Exclusive ILG Self-Cooled Motor never "gums up"

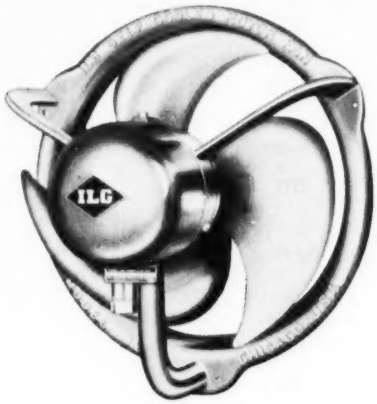
Rugged cast frame keeps working parts aligned

No belts to stretch, wear out, need replacing

No pulleys to waste power, get out of alignment

Pre-lubricated, sealed bearings require no attention, assure years of service

Patented ILG fan blades deliver more air quietly, with greater efficiency



Over a million ILG Self-Cooled Motor Propeller Fans are now in use throughout the world. Specifically designed for exhaust fan duty, they have all the advantages listed at left. Experience testifies to their exceptional performance—whisper-quiet operation, economy of power, freedom from maintenance, and long years of life. Easily mounted in window, wall, or penthouse (with automatic shutter). Wide range of types and capacities.

FREE—complete data Bulletin No. S313. Phone or write for your free copy.

Weather-tight housing—rain and bird-proof

Self-Cooled Motor—direct-drive

Rigid, welded chassis—no sags

Backward curved, centrifugal type, non-overloading fan wheel

Inlet cone eliminates eddy currents

Accessible automatic or electric air controller

ILG "One-Name-Plate" Guarantee

Practically no curbing required—cuts cost

These new ILG Power Roof Ventilators have found their way into the specifications and onto the roofs of important buildings throughout the nation. They answer the demand for "package" ventilators for use on vertical flues or duct systems. Easily installed, complete with desirable air-handling features, with all parts easily accessible, they have the ability to run C-O-O-L even on hottest roofs.

FREE—data on complete line of new Power Roof Ventilators. Ask for Bulletin No. 1902.

ILG knows ventilation!

ILG ELECTRIC VENTILATING CO.
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Offices in more than 50 Principal Cities

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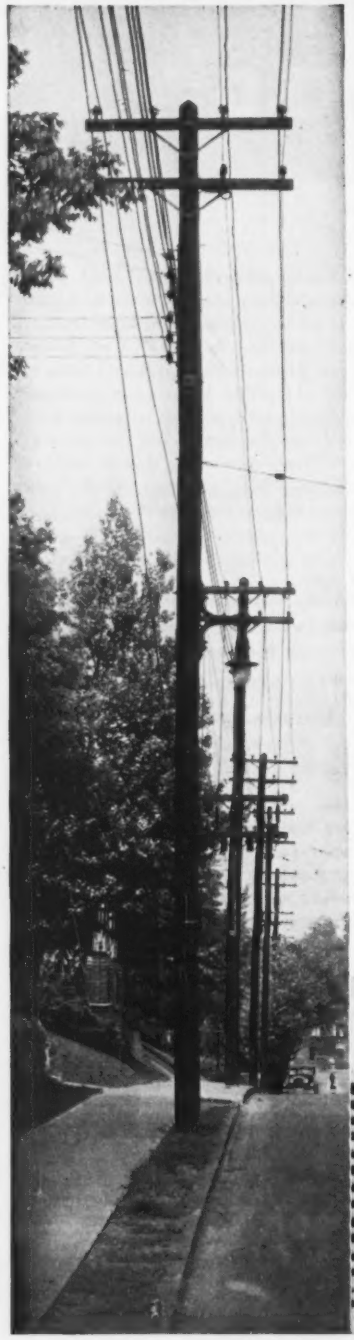

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of

Selected Sound Timber Scientifically Treated

THE lasting strength of International Creosoted Pine Poles plus their low ultimate cost makes them the safest and most economical poles that can be purchased. For more than 75 years, numerous service records of pole treatments have been utilized to perfect the present production practices for International Creosoted Poles. As a result of the lessons learned during this long experience, International Creosoted Poles will assure trouble-free, continuous service. Their straight, clean, smooth surfaces perfectly adapt them for street lighting, rural and urban distribution.

International Creosoted Pine Poles are manufactured and distributed by two of the oldest companies serving the utility industry. They have grown up together, ready always to serve with quality poles, framed correctly, and shipped when needed.

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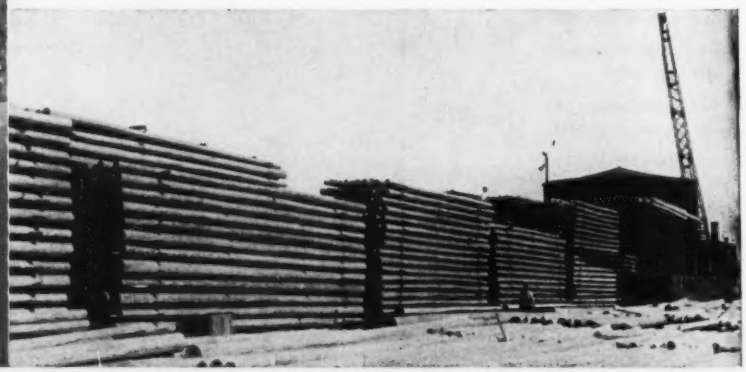

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PRODUCERS OF HIGH GRADE TREATED TIES, POLES, PILES, ETC.

Galveston — Beaumont — Texarkana

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JEFFERSON ELECTRIC

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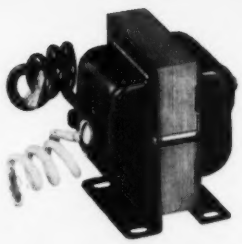
proved performance — proved satisfaction

BETTER BALLASTS FOR BETTER LIGHTING

Billions of hours of ballast operation by millions of Jefferson Ballasts have built their reputation for superb performance, economy, and trouble-free long life. The instant acceptance of U.L. Listed and E.T.L. Certified Jefferson Ballasts makes them the ideal line for you. All types of series sequence and lead-lag ballasts are available for every fluorescent or Slimline lamp installation, indoors or out. All are guaranteed for your protection. Stock up now!



JEFFERSON WIZARD BELL TRANSFORMER REPLACES 4 MODELS

Reduce door bell, buzzer, annunciator and door opener transformer stock by two-thirds—meet every requirement with a small, fast-moving stock of Jefferson universal mounting transformers!

Jefferson "Wizard" has a patented lip and set-screw to clamp transformer to outlet box, cover or cabinet. No mounting plates of any kind are needed. The foot bracket permits mounting for open wire installations anywhere. Primary leads and secondary terminals for bell wires are provided. 10 volt secondary—5 watts. *Listed by Underwriters' Laboratories, Inc.* Stock up now!

QUALITY FUSES FOR POSITIVE ELECTRICAL PROTECTION

Jefferson Saf-T-Lag thermal fuses enable you to fuse more closely to the load rating than any other type of fuse. Extra long time lag holds against motor starting loads and other temporary overloads to prevent needless shutdowns—yet Saf-T-Lags provide instant short circuit protection and thermal protection to motors, switches and panelboards.

A complete range of sizes of Saf-T-Lags, Super-Lags, Jefferson-Union Renewable, Gem Non-Renewable, Plug fuses and Jefferson Fustats are available to meet every requirement for maximum electrical protection. *Listed by Underwriters' Laboratories, Inc.* Stock up now!

JEFFERSON ELECTRIC COMPANY

BELLWOOD, ILLINOIS

In Canada: Canadian Jefferson Electric Co., Ltd., 384 Pape Ave., Toronto, Ont.

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The Name is **Alcoa**

First in Aluminum Conductors and Accessories

The place is **GraybaR**

Your Convenient, Local Source of Supply

Alcoa originated aluminum electrical conductors and accessories. And, for 55 years, Alcoa has pursued a continuous program of research, development and quality control to assure their dependability.

You can take advantage of Alcoa leadership by calling your local Graybar branch and specifying Alcoa products.

Alcoa Aluminum

ALUMINUM COMPANY OF AMERICA

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THEY'RE PUNCTURE PROOF!

If it's on the pin, it's in service!

No more searching for defective insulators when your lines are protected with NEW Kimble *Tempered* Glass Insulators.

Why? Because these new insulators are puncture-proof. Exhaustive laboratory tests at values far in excess of A.I.E.E. standards have proved it impossible to puncture a Kimble *Tempered* Glass Insulator in air—*even under voltage impulses far above normal service rating*. Four years of field testing on more than 500 miles of line have produced no puncture failures. Even lightning surges have failed to damage these new Kimble *Tempered* Glass Insulators.

In the event of shattering due to severe mechanical shock, insulator disintegrates into small non-sharp fragments. Trouble shooters can locate broken insulator—fast.

What's the secret? *Tempering*, a Kimble development in glass that adds a new element to the many natural virtues of glass. It's an exclusive Kimble production method that gives Kimble insulators a hard-compression surface layer that makes them strong enough to meet the severe tests required.

Why not see how *tempered* glass can cut your line maintenance costs. Write for descriptive folder that gives complete details. Address: Kimble Glass Company, Dept. EW6, Box 1035, Toledo 1, Ohio.

KIMBLE GLASS COMPANY
Toledo 1, Ohio—*Subsidiary of Owens-Illinois Glass Company*

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AUTOMATIC CONTROLS

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PRESSURE

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RELAYS

Single & Multiple Circuits

EXPLOSION-PROOF

FOR EVERY TYPE OF APPLICATION

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Pressures to 400 lbs.

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If you have a problem involving the automatic control of pressure, temperature, liquid level, mechanical operations, etc., it will pay you to consult Mercoid's engineering staff—always at your service.

For illustrated catalog describing the entire line of Mercoid Controls write for Catalog No. 700A

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OshKosh

POLE LINE TOOLS

it pays to have the right equipment

- Extension Ladders
- Sectional Ladders
- Carrying Hooks
- Diggers
- Peavies
- Cant Hooks
- Shovels
- Digging Bars
- Pike Poles
- Pike Pole Guards
- Pole Supports
- Tamping Bars
- Spoons
- Reels
- Tree Trimmers
- E-Z-Up Pole Cradle
- Folding Barricades
- Warning Signs (Paint or "Scotch-Lite")

"Oshkosh" Tools pay dividends in three ways: (1) Longer Life, (2) Better man-hour performance, and (3) Higher safety factor. Over a half-century of tool-making experience goes into the quality of every tool. This extra quality is all *yours*—at no extra cost.

Write for our latest catalog.

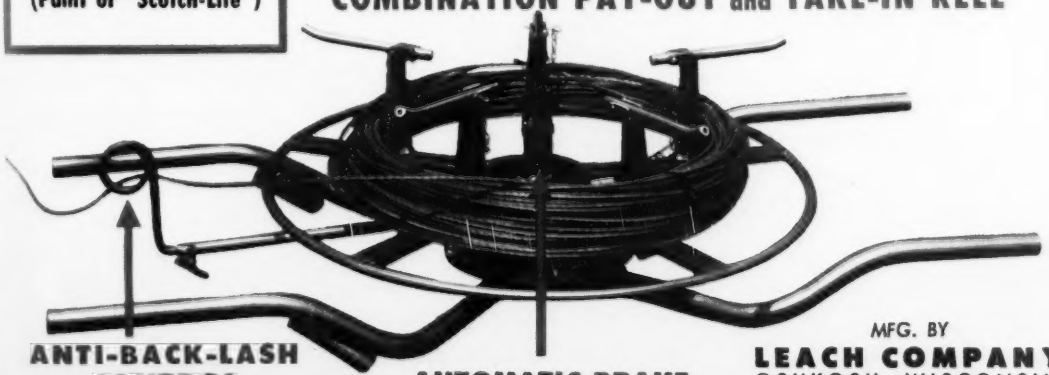
SAFETY LADDER

Full range of lengths. Straight or flared side rails. Equipped with pole grippers, rubber-faced tips, rubber-guarded pikes, transparent safety finish, patented safety lock.

SAFETY LOCK

Ladder is extended by merely pulling rope. Safety Lock automatically lifts up to allow rungs to pass. To lower, operator gives a slight pull to release lock and then lets top section down *slowly*. It cannot be lowered fast as the lock will then automatically close.

COMBINATION PAY-OUT and TAKE-IN REEL



ANTI-BACK-LASH CONTROL

AUTOMATIC BRAKE

MFG. BY
LEACH COMPANY
OSHKOSH, WISCONSIN

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They go together

Nicopress TOOLS
Nicopress SLEEVES

Together they make the Perfect Splice

The National Telephone Supply Company

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SPECIFY LIFE-TIME PROTECTION NATIONAL ELECTRIC SHERARDUCT

Rigid Steel Conduit

HERE'S WHY—

1 It's the Sherardizing process that *fortifies* Sherarduct against rust and corrosion. This process drives a pure zinc coating into the steel surface—alloys the coating to the steel wall.

2 Still further protection is provided by the baked-on Shera-Solution coating that *seals* the zinc—fortifies SHERARDUCT against acids and other corrosive elements.

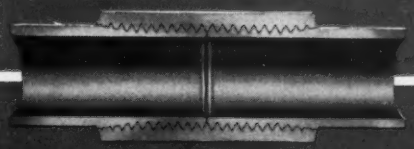
3 Even the base of the clean, sharp threads of Sherarduct Rigid Steel Conduit have full zinc protection. No need to worry about threads rusting even *before* you install it—not when you use *SHERARDUCT!*

THE SHERARDUCT COUPLING

. . . all surfaces and threads are zinc protected same as the conduit.

. . . accurately undercut threads permit completely closed joints . . . no raw threads exposed. No gaps to interfere with "easy fishing."

. . . further protected by baked-on Shera-Solution coating. Fully protected where danger of corrosion is greatest in conduit systems.



***The Result*—SHERARDUCT IS PERMANENTLY FORTIFIED FOR LIFE-TIME WIRING PROTECTION**

EVERYTHING IN WIRING POINTS TO

National Electric Products

PITTSBURGH, PA.

8 Plants • 7 Warehouses • 34 Sales Offices

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

Distributed by GraybaR

How to Get More Than Five Year's Use From This Insulator!

If we told you that an O-B six-inch suspension insulator might not last five years, you would rate it as a poor buy - - but this can be exactly the case. A primary deadend, built today with one six-inch unit, for operation up to 4,000 volts, may serve adequately. But, residential demand has risen 300 per cent in only ten years, and it may double again in the next five, according to many authorities. Will 4,000 volts supply this demand? If not, the deadend must be rebuilt, because it didn't last five years!

Suspension insulators, as a mechanical device, are indefinitely durable. The same can't be said, however, about the plans on which their use is based. If you want reasonable service from primary deadends, build them just once instead of *twice* - - build them with *two* insulator units that will handle 12,000 volts without further attention or expense. It will save you money in the end.

Ohio Brass

MANSFIELD · OHIO

4398-H

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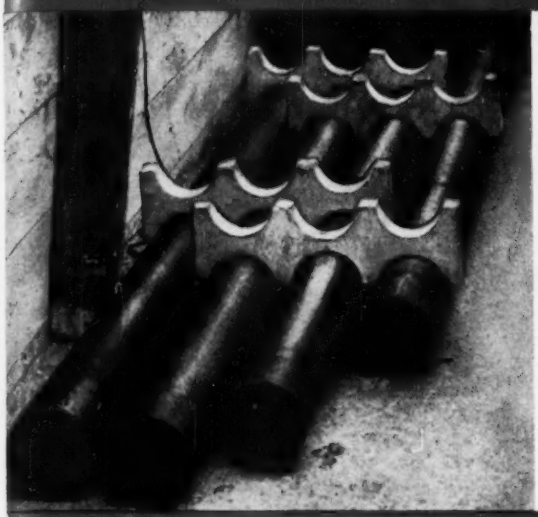
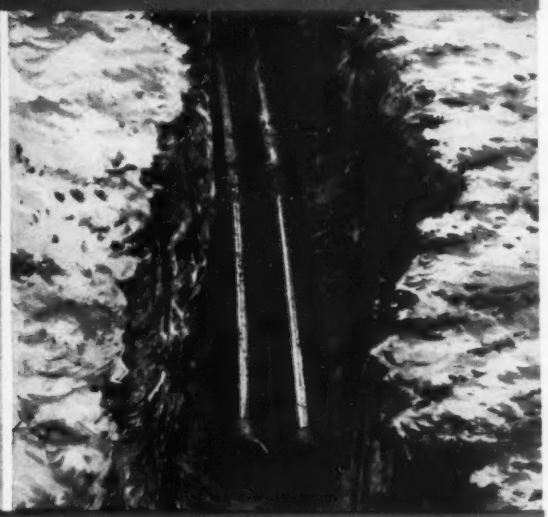
ORANGEBURG
FIBRE CONDUIT



STANDARD is installed with concrete encasement. Preferred for banks of three or more ducts.



NOCRETE is installed without concrete encasement. Extra heavy wall for direct burial—practical for many single or double duct runs.

1893 ~ 60th Anniversary ~ 1953

COMPLETE CABLE PROTECTION AT MINIMUM COST

Orangeburg has had 60 years experience in the manufacture of non-metallic conduit serving the Power and Light, Telephone, General Construction, Railroad and other industries.

Orangeburg—the pioneer—has originated the outstanding advancements of the non-metallic conduit industry.

Orangeburg is a leader in every city and state.

ORANGEBURG QUALITY IS TIME TESTED

Orangeburg material is strong, tough and resilient. Lasts indefinitely. No cracks or breaks when properly installed. Impermeable walls, smooth bore. Low coefficient of friction. Resists acids, alkalies, salt and oil in ground waters. Water-tight joints. Light, easy to handle and tool. Lays faster and at lower cost than any other type of conduit.

Send to Dept. EWK3 for facts. ORANGEBURG MANUFACTURING CO., INC., ORANGEBURG, N. Y.

ORANGEBURG FIBRE CONDUIT

STANDARD INSTALLED WITH CONCRETE

NOCRETE INSTALLED WITHOUT CONCRETE

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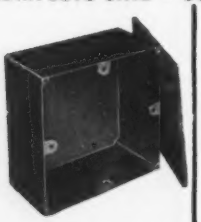
O. Z. cast iron boxes

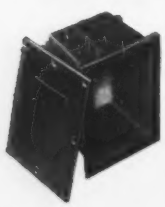
COMPLETE LINE • COMPLETE LINE • COMPLETE LINE COMPLETE LINE



TYPE YS
Unflanged junction box with cover. Flush or Surface mounting.

TYPE YW
Weatherproof pull box. Complete with one-piece rubber gasket and hinged cover; surface mounting.

TYPE YE
Explosive resisting junction box designed in accordance with Underwriter's Laboratory requirements. Cover and flange are accurately machined and correct bolt spacing provided. Flush or Surface mounting.



TYPE YF
Flanged watertight box with cover complete with rubber gasket. Flush or Surface mounting.

When you specify O. Z. Cast Iron Boxes for industrial, railroad, airport, oil refinery and other heavy-load circuits, you specify the best. Cast from close-grained, grey iron, these sturdily constructed boxes are accurately machined to your requirements and then hot-dip galvanized to provide maximum corrosion resistance.

No matter what the operating condition . . . explosion resisting, watertight or weatherproof . . . you'll find a box to fit the job in O. Z.'s complete line. All boxes can be supplied with or without bosses or mounting lugs and are drilled for conduit entrances as required.

For detailed information on O. Z.'s Cast Iron Boxes as well as 150 other electrical fittings, write for our catalog.

- CAST IRON BOXES
- SOLDERLESS CONNECTORS
- CONDUIT FITTINGS
- CABLE TERMINATORS
- GROUNDING DEVICES
- POWER CONNECTORS

Buy O. Z. and you'll see why Engineers say,

"They're OK If They're O. Z."

O. Z. ELECTRICAL MANUFACTURING COMPANY, INC.

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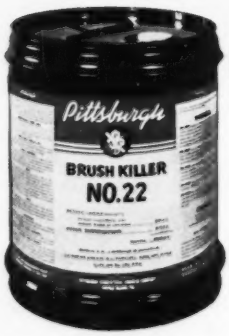
You could kill brush on your Right-of-ways like this...

but for sure, safe results use



Pittsburgh BRUSH KILLER No. 22

Brush and nuisance growth along your powerline right-of-ways can hamper your service crews and cost you real money in maintenance dollars. That's why power companies everywhere use Pittsburgh Brush Killer No. 22 for safe, effective right-of-way clearance. It kills brush faster and at far lower cost than hand methods, and its thorough control lessens danger from fire, encourages sod growth and thus reduces soil erosion. And because Pittsburgh Brush Killer No. 22 contains the new low volatile Isooctyl ester, danger to nearby crops is minimized. Be sure to get the most from *your* brush control dollar this year by ordering "Standard for Quality" Pittsburgh Brush Killer No. 22 (or Pittsburgh Lo-Vol 4 for especially hardy, tough-rooted brush) *today!*

PITTSBURGH AGRICULTURAL CHEMICAL COMPANY

EMPIRE STATE BUILDING, NEW YORK 1, NEW YORK

WAD 4704

Standard for Quality

ORGANIC INSECTICIDES: Benzene Hexachloride, Toxaphene, Dichloro Diphenyl Trichloroethane, Aldrin, Dieldrin, Chlordane.

ORGANIC PHOSPHATE INSECTICIDES: Parathion Wettable Powders, Parathion Liquid Concentrate, Metacide, Systox.

WEED KILLERS: 2,4-D Acid, 2,4-D Amine Concentrates, 2,4-D Ester Formulated Concentrates, 2,4-D Sodium Salt Monohydrate, D4 (Low Volatile 2,4-D Ester), 2,4,5-T Formulations.

FUNGICIDES, SEED DISINFECTANTS, COTTON SPRAYS AND DUSTS, AND OTHER SPECIAL AGRICULTURAL CHEMICALS.

A DIVISION OF
PITTSBURGH COKE & CHEMICAL CO.
Grant Building - Pittsburgh 19, Pa.

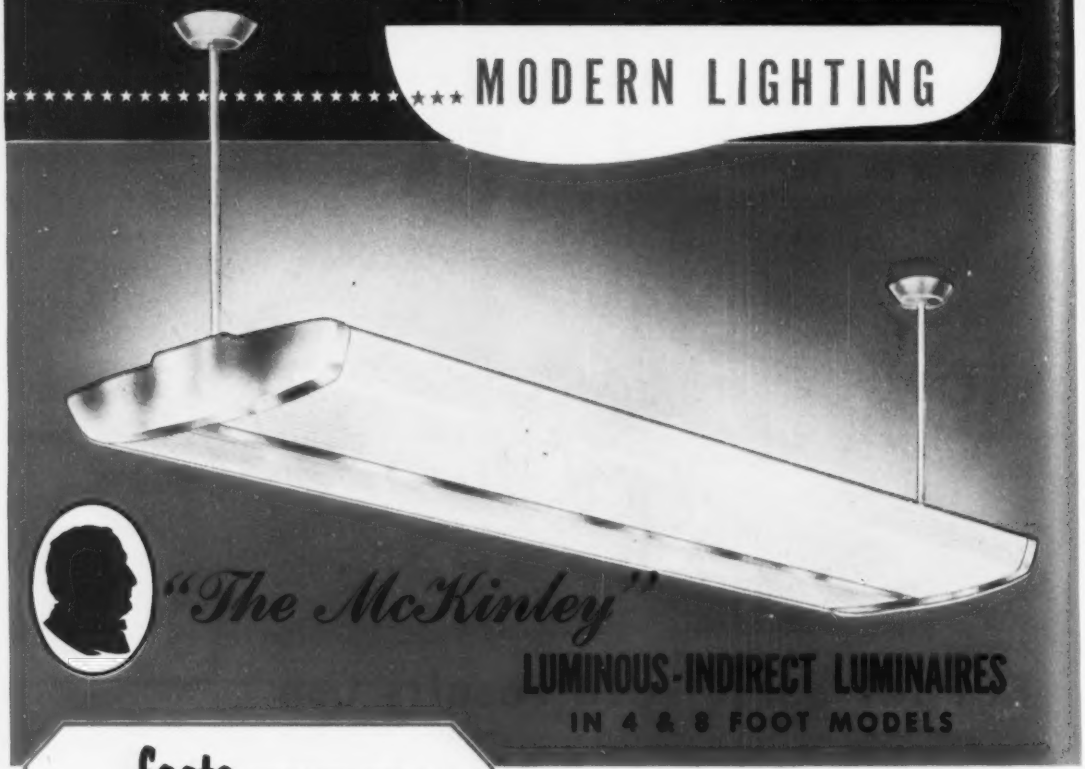
COAL CHEMICALS • AGRICULTURAL CHEMICALS • FINE CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

Distributed by Graybar

setting NEW high standards in.....

...MODERN LIGHTING



"The McKinley"

LUMINOUS-INDIRECT LUMINAIRES

IN 4 & 8 FOOT MODELS

facts ABOUT THE NEW A & B-9000 SERIES, 4 & 8 FOOT "McKINLEY" FLUORESCENT LUMINAIRES

- **THE McKINLEY** is available in 4 or 8 foot units using two lamp bi-pin fluorescent lamps. In slimline lamps, it is available in 4 and 8 foot, two and four lamp units.
- **THE McKINLEY** is pendant mounted individually or in continuous rows using time-saving Pittsburgh "H" series hangers.
- **THE McKINLEY** has a rugged chassis. 8-foot units need hangers only at the ends. On all units, hangers may be installed at any point along the raceway to avoid pipes, beams and other obstructions.

WRITE for DATA SHEET

Bulletin B-9 contains complete information and dimensions on the new "McKinley." Write for your copy today.

"The McKinley"—newest addition to the famous Pittsburgh Presidential Series of Fluorescent Luminaires—is setting new high standards for *luminous-indirect* luminaires. Beautiful, modern styling plus high overall efficiencies make it truly a creative example of sound illuminating engineering.

The luminous panels of white, ribbed polystyrene give "The McKinley" high reflectivity with low surface brightness and produce a luxurious quality of illumination. When lighted, the luminaire blends into the ceiling since its brightness and that of the ceiling are almost equal.

"The McKinley" more than meets the brightness specification of the Illuminating Engineering Society, the American Institute of Architects and the American Standards Association.

PITTSBURGH

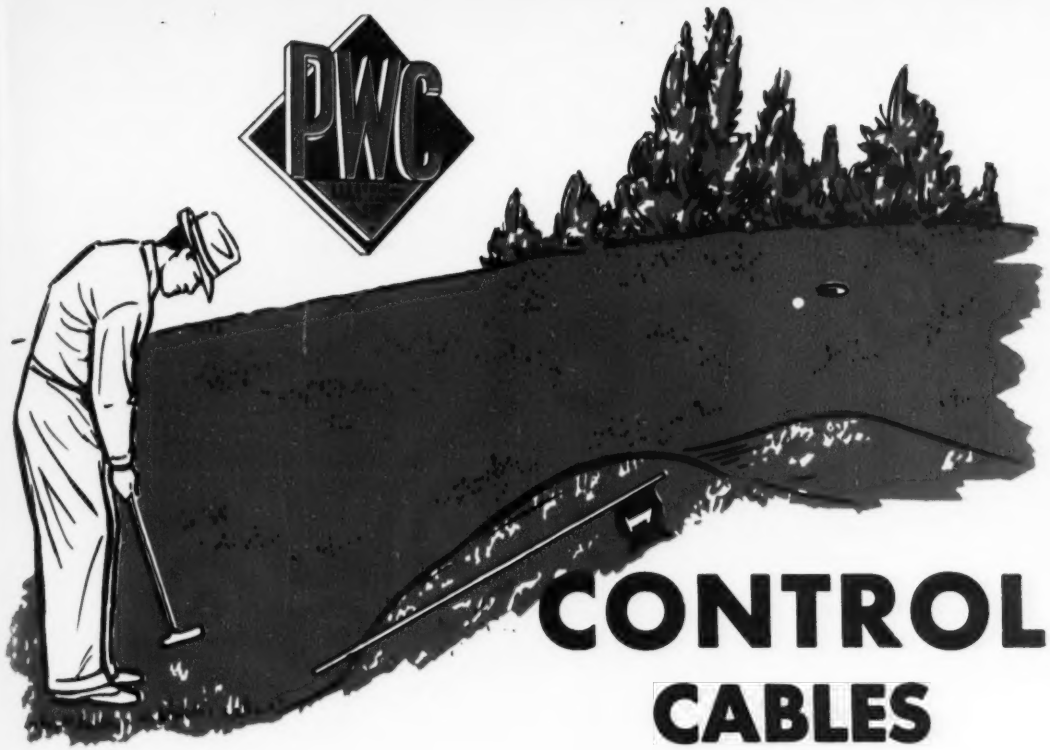
REFLECTOR COMPANY

408 OLIVER BUILDING • PITTSBURGH 22, PENNSYLVANIA

Manufacturers of Fluorescent and Incandescent Lighting Equipment

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

Distributed by Graybar



CONTROL CABLES

PWC Control Cables for supervisory and station control circuits are manufactured in accordance with the Insulated Power Cable Engineers Association Specification.

Flexible control cables for flexible and extensible connections in machine tools and portable equipment conform in every way to the Underwriters' Laboratories Standards and the National Electrical Code.

Signal, police and fire alarm cables are manufactured in accordance with International Municipal Signal Association Specifications and National Board of Fire Underwriters.

PWC makes control cables to many specifications, but our attention to unspecified details is the keystone to our reputation for quality.

Write for PWC Control Cable Catalog

UF Cables *Power Cables* *Flexible Cords* *A - Z Cables*

PLASTIC WIRE & CABLE CORPORATION

JEWETT CITY, CONN.

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

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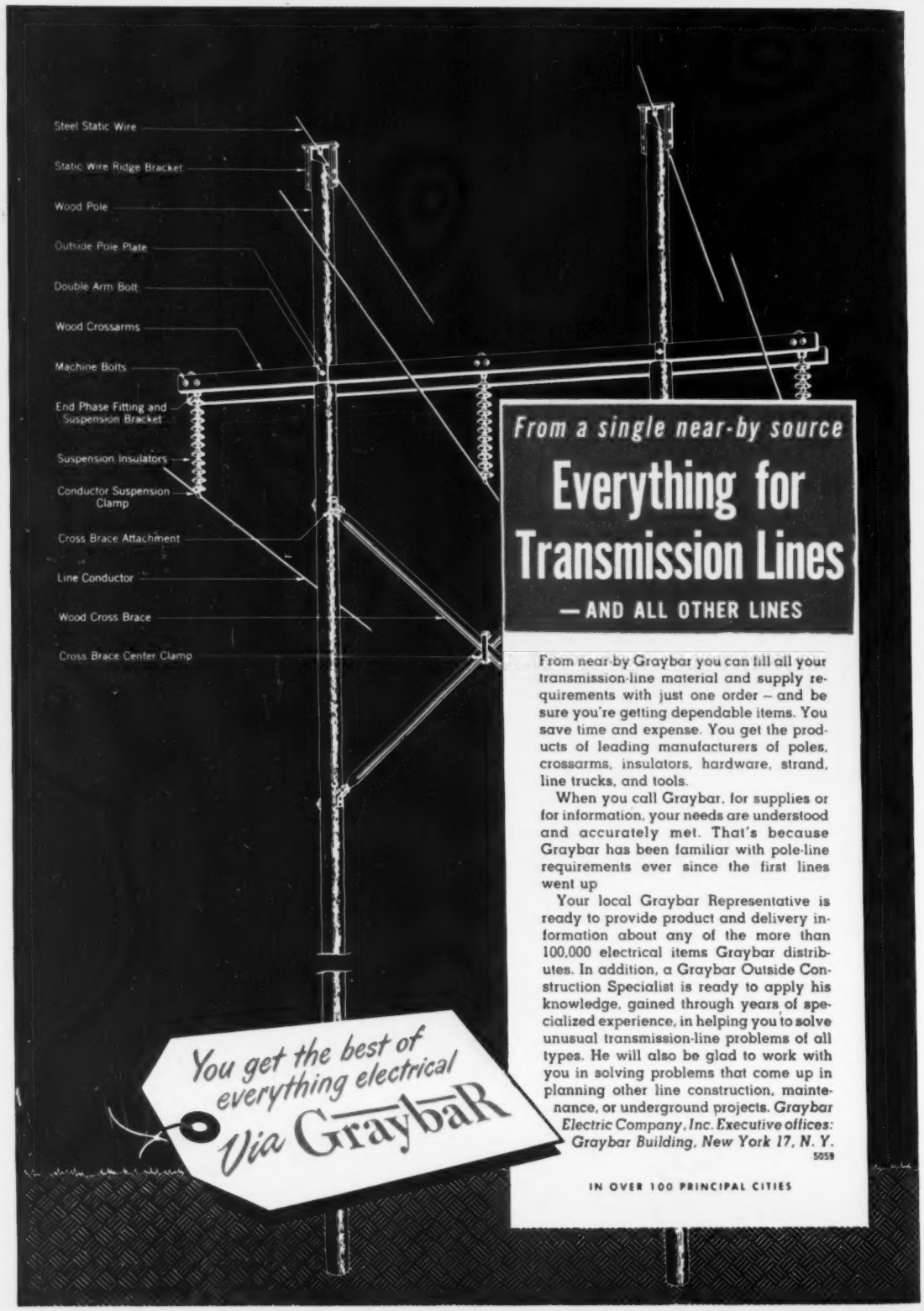


From a single near-by source

Everything for Transmission Lines

— AND ALL OTHER LINES

From near-by Graybar you can fill all your transmission-line material and supply requirements with just one order – and be sure you're getting dependable items. You save time and expense. You get the products of leading manufacturers of poles, crossarms, insulators, hardware, strand, line trucks, and tools.

When you call Graybar, for supplies or for information, your needs are understood and accurately met. That's because Graybar has been familiar with pole-line requirements ever since the first lines went up

Your local Graybar Representative is ready to provide product and delivery information about any of the more than 100,000 electrical items Graybar distributes. In addition, a Graybar Outside Construction Specialist is ready to apply his knowledge, gained through years of specialized experience, in helping you to solve unusual transmission-line problems of all types. He will also be glad to work with you in solving problems that come up in planning other line construction, maintenance, or underground projects. *Graybar Electric Company, Inc. Executive offices: Graybar Building, New York 17, N. Y.*

5059

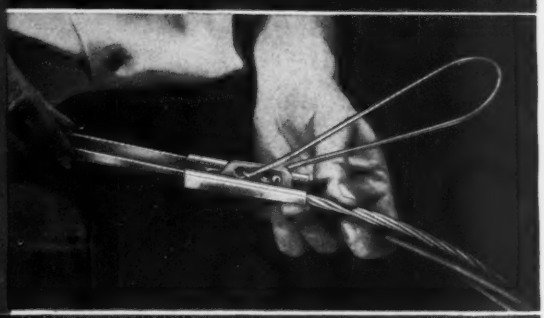
IN OVER 100 PRINCIPAL CITIES

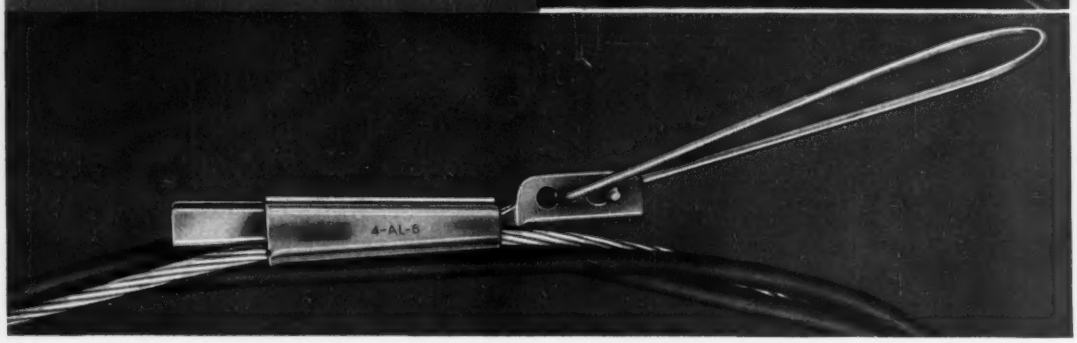
You get the best of everything electrical Via GraybaR

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

Distributed by Graybar

NEW Reliable ALUMINUM SERVICE WEDGE CLAMP Offers INSTALLATION ECONOMIES





THIS WEDGE CLAMP CAN BE APPLIED TO BARE NEUTRAL ANYWHERE IN THE RUN

Aluminum service cable can now be put up and sagged before the cable is cut with the new Reliable 7080 service wedge clamp. The cable can then be cut to exact length with no waste. You don't have to feed an end of the cable through the clamp. This new clamp permits easy attachment to bare neutral of twisted service drop cable at any point in the span.

Simply slip the aluminum shell around the bare neutral and insert stainless steel wedge along steel rails. It grips securely, tightens automatically under load and does not depend upon screw clamps. Load is generously distributed over long surfaces of shell and wedge to avoid damage to conductor. The stainless steel bail can be used with hooks, spools or knobs. One leg is removable for ease of installation.

This clamp is equally suitable for open wire aluminum services, and it will accommodate all #6 and #4 sizes and #2 solid.

Write for more detailed information, or ask for a practical demonstration.

Reliable ELECTRIC COMPANY

3145 CARROLL AVENUE
CHICAGO 12, ILLINOIS

OVER 45 YEARS OF SERVICE TO THE UTILITIES

POWER-LINE CONNECTORS and CONSTRUCTION SPECIALTIES

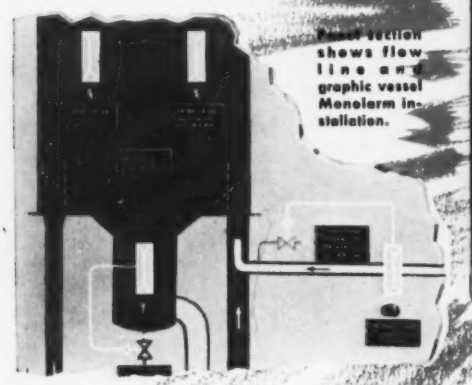
HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

Distributed by GRAYBAR

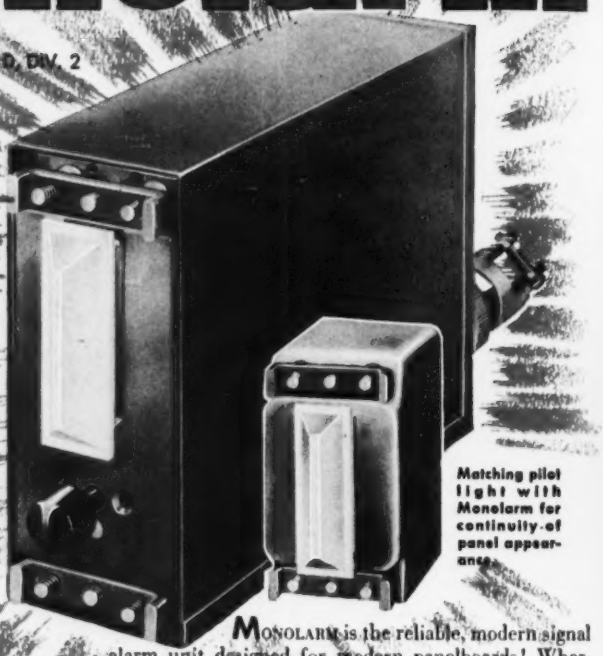
Announcing . . . **R&S Monolarm®**

CLASS I, GROUPS C & D, DIV. 2

. . . the Compact signal alarm unit ideal for flow line and graphic panels



Panel section shows flow line and graphic vessel Monolarm installation.



Matching pilot light with Monolarm for continuity of panel appearance.

MONOLARM is the reliable, modern signal alarm unit designed for modern panelboards! Wherever instrumentation space is at a premium—wherever flow lines and graphic vessels must tell their visual processing story without interference from bulky signal alarms—this exclusive R & S development takes over with minimum space on front and back of panels.

Monolarm offers instant warning against any abnormality occurring in a processing operation at any time—and safeguards against expensive losses of production and materials. Should any abnormality occur, the normal light ceases to shine . . . the alarm light flashes rapidly on and off . . . also an external howler, if used, is sounded. Acknowledgment by the operator must be made by turning the re-set switch . . . the alarm light then assumes a steady state until the condition is remedied . . . then Monolarm automatically resumes its normal indication.

Several hundred highly successful installations are already completed. Monolarm is now available on your order.

Advantages of R&S MONOLARM

1. A single narrow bezel and button fits into a flow or graphic line diagram without interrupting the continuity of the design story.
2. Occupies minimum back-of-panel mounting space.
3. Lighting indications in two or three colors on *one* bezel.
4. Relamping is quick and easy from the front of the panel.
5. Instantaneous connect and disconnect of the power supply cable to Monolarm is provided by an interlocking switch receptacle and plug.
6. Maximum safety is afforded by interlocking the plug with the hermetically sealed switch, making it impossible to insert or withdraw plug under load. When the polarized plug is inserted into the receptacle and the plug shell is turned clockwise, it turns the switch to the "On" position and vice-versa.
7. Hermetically sealed plug-relays instantly removable if replacement is necessary.
8. Time delay circuit available to counteract turbulence and vibration when abnormal condition is reached.

• *Write for Sales Data Sheet #21253— 20*

RUSSELL & STOLL COMPANY, INC. • 125 BARCLAY STREET, NEW YORK 7, N. Y.

RUSSELL & STOLL

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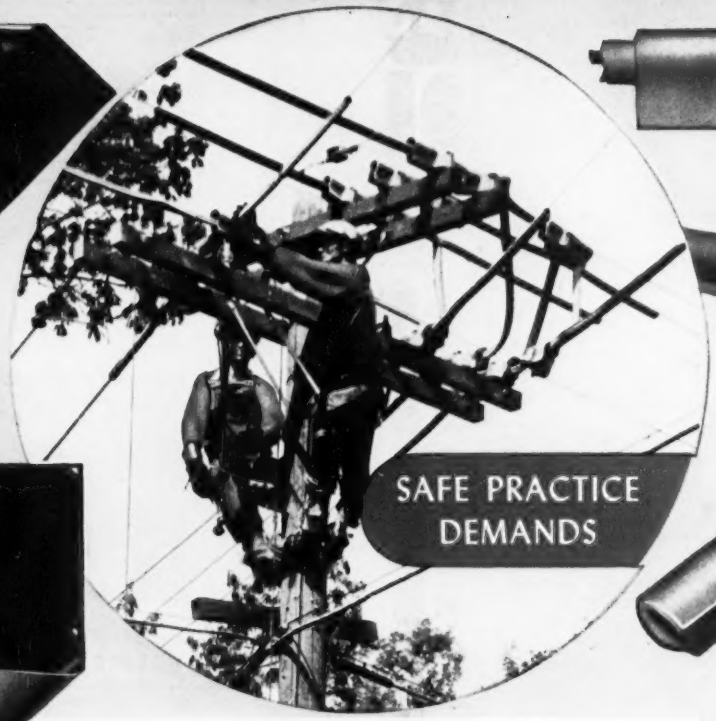
DEVICE FOR EVERY ELECTRICAL HAZARD



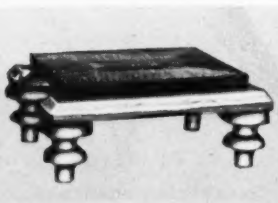
SALISBURY

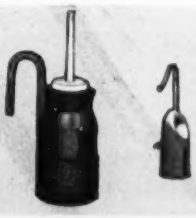
RUBBER PROTECTIVE DEVICES

• For linemen and others who work on or near energized equipment . . . Approved by safety engineers from coast to coast...Adopted for safety by public utility companies everywhere . . . Designed for maximum dependability and convenience in use . . . Made from highest grade materials by the pioneers in manufacture of rubber protective equipment for linemen . . . *Write for Catalog L-4.*

W. H. SALISBURY & CO.

GENERAL OFFICE AND FACTORY
401 NORTH MORGAN STREET, CHICAGO 22





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GRAYBAR

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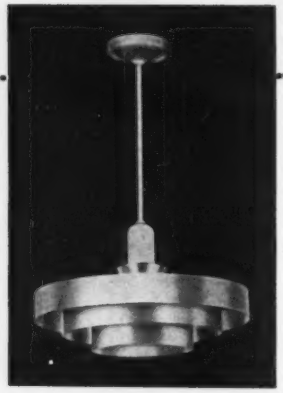
SILVRAY

LIGHTING FIXTURES

FOR

COMMERCIAL
INDUSTRIAL
RESIDENTIAL
AND SCHOOL
APPLICATIONS

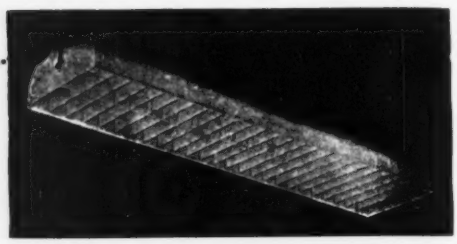


THE SUPER 1500 LINE

Concentric ring indirect luminaires designed to make the most efficient use of the silvered-bowl lamp. 90% of the generated light is uniformly distributed over the ceiling to provide highest quality overall lighting. Requires no cleaning because of vertical surfaces. Relamps from the floor. Used in schools, offices, libraries. Ceiling and pendant types.

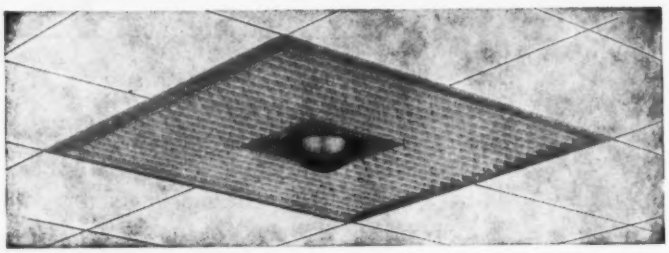
THE 33 LINE

Provides an effective solution for a wide variety of lighting applications, and maximum flexibility to meet specific requirements. Interchangeable louvers provide either 35° x 35° or 40° x 40° shielding. Designed for 2 or 4 fluorescent or slimline lamps. Suspension or close ceiling mounted types for individual or continuous row mounting. Recommended for offices, banks, stores, schools.



SKYLIKE

A SILVRAY ASSOCIATED COMPANY



SKYLIKE: The modern, modular lighting unit designed for use with 150W-500W silvered bowl lamps. Has its own basic reflector, louver assembly and a group of accessories to adapt it to an extremely wide variety of applications and installation requirements. Can be used with silvered or semi-silvered bowl lamps for wide or concentrated light distribution. Easy to install, requires minimum maintenance as there is no place for dust to lodge and they relamp from the floor. Surface, semi-recessed, suspended, recessed types. Ideal for schools, stores, offices and residential applications.

SILVERSPOT: A new modern recessed downlight that provides efficient and precisely controlled direct illumination. Uses 100W-A-21 silvered bowl lamp which in conjunction with reflector and louver eliminates glare from the surface. Surface mounted, recessed and screw-in "adaptor" types. A perfect "spot" for stores and residential application.

SILVERDOT: Similar to above but with 6½" aperture instead of louver. Used to provide accent or special lighting effects in commercial or residential interiors.

Complete information on any of the above Silvray or Skylike units is available at your nearest Graybar district office. There is a descriptive booklet for each unit which will be supplied on request. Contact Graybar or write us direct.

SILVRAY LIGHTING, INC.

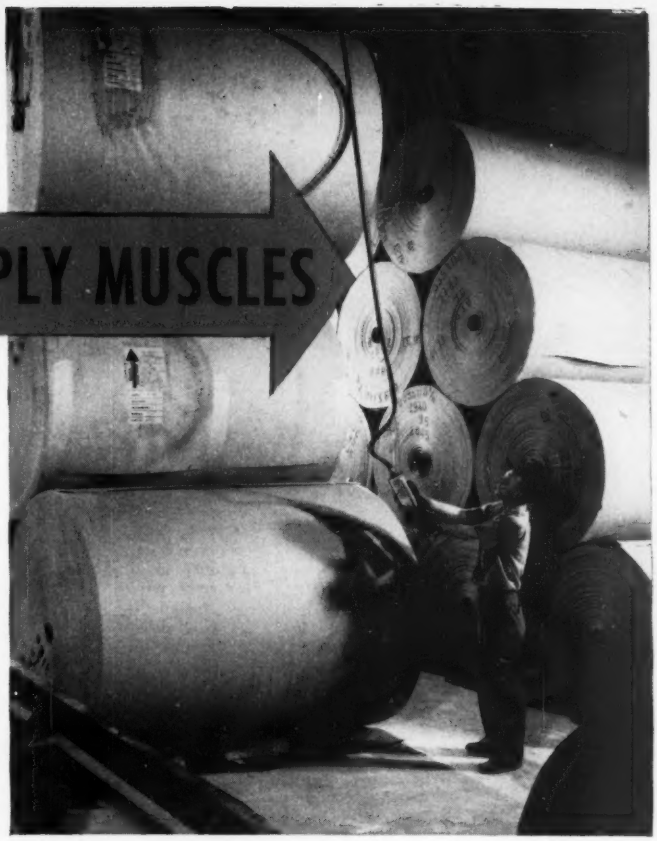
AND ASSOCIATED COMPANIES

RKO BUILDING • RADIO CITY • NEW YORK 20

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

Distributed by GraybaR

HOW TO MULTIPLY MUSCLES



These huge rolls of paper are lifted off delivery trucks and put into the stock piles as easily as though they were spools of thread. It's only another example of how we multiply muscle power with electric muscles. Here an overhead crane operated and controlled by push buttons in the hands of this workman responds like a genie to every direction.

This is only another of the many jobs that TIREX Portable Cords do so well. This pendant control station may be banged around; it is subject to abrasion and to strains of one kind and another. Even oil dripping from the crane may get on this cord. Yet day after day, week after week, even year after year, TIREX Cords give dependable, satisfactory service. Isn't that what you want when you buy a cord? We think so too.

Why don't you buy some TIREX for that difficult job you have and prove to yourself that TIREX lasts and lasts. Get it from your local distributor. He has most sizes in stock. Be sure, though, that you get genuine Simplex-TIREX with the special neoprene armor that is cured in lead.

Simplex

WIRES & CABLES

SIMPLEX WIRE & CABLE CO.

79 Sidney Street, Cambridge 39, Mass.

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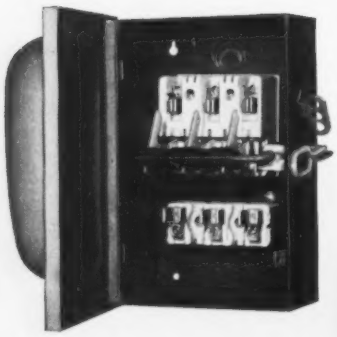
Distributed by Graybar

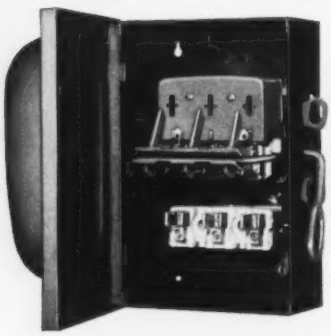
3 LINES OF SAFETY SWITCHES *for* 3 DIFFERENT MARKETS



one switch can't do two or three jobs without compromising price and performance!

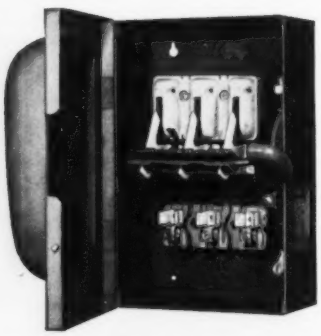
GENERAL USE

90,000 line designed for residential, commercial and other applications where price is limiting and the service factor is not great.



STANDARD DUTY

40,000 line designed for general industrial or institutional and commercial applications where the service factor is greater and price is an important consideration. MEETS BOTH GOVERNMENT AND NEMA SPECIFICATIONS FOR TYPE A SWITCHES.



HEAVY DUTY

80,000 and 50,000 line designed for mass production industries where price is secondary to continued performance under conditions of severe service and maximum safety. The 50,000 line is used where space is limited. BOTH ARE TYPE A but go far beyond those requirements.

UNIFORM STYLING

SAFETY SWITCHES

and other Square D products are distributed by GRAYBAR

SQUARE D COMPANY

1903 • **50** YEARS OF DESIGN LEADERSHIP • 1953

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

Distributed by Graybar

FARADAY®

the Emblem of Quality since 1875

Electrical Signals and Systems

UNIPACT SIGNALS. Need one—or a series of bells, chimes, buzzers or horns? You can have your choice, because these various types of signals are interchangeable; no new wiring is needed. UNI-PACT Signals meet noise level requirements with tailor-made results.

FARADAY FIRE SYSTEMS. FARADAY Fire Alarms provide *extra* protection. A wide variety of systems to meet all fire warning requirements. Models available for surface or semi-flush installations. FARADAY is known for dependability throughout the industry.

FARADAY CLOCKS. Can be furnished for remote control by master units, or for direct-operating installations. FARADAY models are supplied for either surface or flush mounting, in 10, 12, 15 and 18 inch sizes. Easy-to read dials are white, with bold Arabic numerals.

FARADAY BELLS AND BUZZERS. A complete selection of both bells and buzzers for homes, offices, hotels and apartment buildings. Attractive appearance . . . long-lasting. Years of research and production experience make FARADAY signals the outstanding brand—always dependable.

CONSULT YOUR ELECTRICAL WHOLESALER FOR COMPLETE DETAILS.

HOLTZER-CABOT **FARADAY** STANLEY & PATTERSON

CONSOLIDATED BY:

SPERTI FARADAY INC.

ADRIAN, MICH.

BELLS • BUZZERS • HORNS • CHIMES • VISUAL AND AUDIBLE PAGING DEVICES AND SYSTEMS

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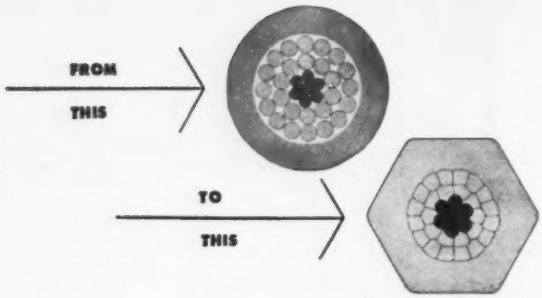
T & B METHOD



. . . IN SECONDS

Compression Dead End

THE STRONGEST CONNECTION FOR ACSR

T & B connector assemblies for dead-ending ACSR develop tensile strengths greater than that of the cable itself. Coated serrations inside the inner clevis barrel provide a sure, certain grip that matches the full strength of the steel core. The aluminum outer compression sleeve assures high conductivity of the joint. Both sleeves are easily installed with light-weight, portable T & B METHOD hydraulic tools which compress joints hexagonally and force the fitting and cable into one homogeneous mass . . . all in a few seconds.

Electrically, T & B Dead Ends offer higher conductance than equal lengths of cable — the one-piece aluminum tube provides uninterrupted current path from cable to jumper loop. During compression, the special serrated T & B compression sleeve penetrates the aluminum oxide film on the *outside* cable strands providing clean overall metal-to-metal contact, as well as minimum current loss. Oxide film on the *inner* strands is also effectively abraded, thereby maintaining a dense, tight joint.

Though the use of an oxide-inhibiting agent is recommended for T & B METHOD aluminum connections, no joint compounds are needed to obtain maximum electrical efficiency.

Investigate the complete line of T & B fittings for ACSR, aluminum cable and copper cable installation — they offer you important savings in time and installation costs. Write for your free copy of T & B Bulletin U-2.

LOOK FOR THIS SIGN —

IT'S THE MARK OF AN AUTHORIZED T & B DISTRIBUTOR

The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs.

T37

THE THOMAS & BETTS CO.

INCORPORATED

14 Butler Street • Elizabeth 1, New Jersey
Thomas & Betts Ltd., Montreal, P.Q., Canada

MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898

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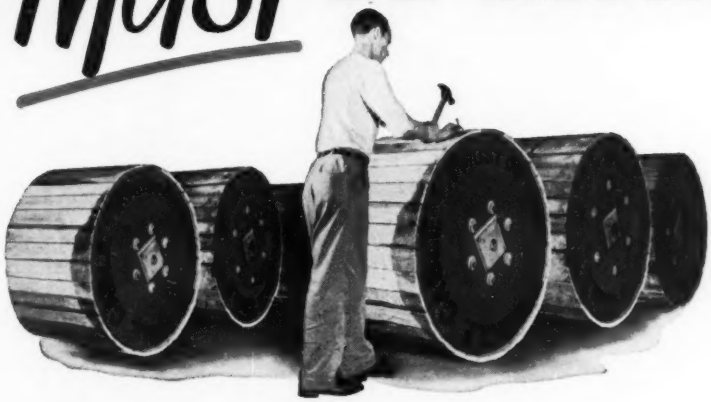
IT TRIANGLE

IT *Must* BE RIGHT!



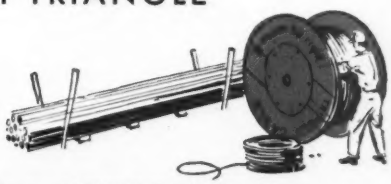
Walk into any one of Triangle's factories and the first thing to greet your eye is a sign: "It *Must* Be Right!" Then, walk between the long lines of whirling, pounding, busy machines. Every few feet you'll see those words — "It *Must* Be Right!"

That philosophy has been the order of the day at Triangle ever since the moment, back in 1916, when the wheels first began to turn. Everything at Triangle, from product through service, *must* be right.

Every day our customers benefit from this policy. Every day they get extras in quality and service they had not been able to get elsewhere.

Perhaps you too would benefit by doing business with a company who thoroughly understands its obligation to its customers.

You'll like doing business with TRIANGLE



The Trade Mark of TOP Quality

TRIANGLE

TRIANGLE CONDUIT & CABLE CO. Inc.

New Brunswick, New Jersey

When it's a Question of Carrying Electrical Power—Specify **TRIANGLE**

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Distributed by GraybaR

DEPENDABLE POWER

FOR DRILLING HOLES IN STEEL . . . WOOD . . . MASONRY

Standard in industry since portable power drills were first developed, the name THOR has stood for DEPENDABLE POWER for over 59 years!

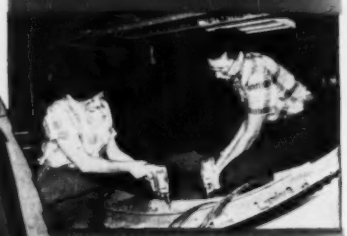
The new Thor "Silver Line" Electric Drills are available in 39 sizes, styles and speeds to meet every shop and field requirement. YOU NAME IT, THOR HAS IT . . . .

Improved motor . . . all ball-bearing construction . . . die-cast precision-fitted housings . . . PLUS an endless list of "extras"—these are the penny-savers and dollar-savers that make Silver Line Drills your best buy today!

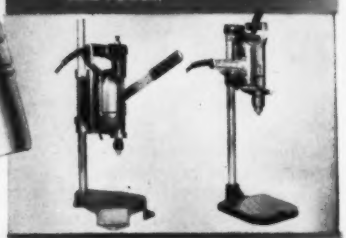
Factory branch sales and service in principal cities. Free 1953 catalog upon request. Thor Power Tool Company Aurora, Ill.

Thor PORTABLE POWER TOOLS

MOST POWERFUL ½" DRILL ON THE MARKET—Mining companies use this tool with carbide bits to drill 1¼" holes in *solid rock!*



THOUSANDS OF THOR DRILLS in use today in any industry you can name — selected by purchasing agents and tool superintendents for DEPENDABLE POWER!



DRILL STANDS for all sizes convert portable drills to stationary use as powerful-leverage drill presses.

THOR SERVICE STATIONS IN PRINCIPAL CITIES make fast, factory-standard repairs when tool parts wear.

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IMPACT WRENCHES • SAWS • HAMMERS • DRILLS
AUTOMOTIVE VALVE SHOP TOOLS • SANDERS • POLISHERS
SCREWDRIVERS • NUT SETTERS • SANDERS • NIBBLERS

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OUTSTANDING IN INSULATION

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LAYTEX® RUH-RUW—The world's smallest diameter, lightest weight natural rubber-covered power and lighting wire.

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ALUMINUM WIRES AND CABLES—U. S. Rubber introduced insulated aluminum conductors.

ELECTRIX® PLUGS—U. S. Rubber was a pioneer in the development of soft rubber plugs for extension cord sets and power supply cords. (Also all rubber cube taps.)

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TWISTED SERVICE DROP CABLE—Either neoprene insulated or performance insulation and neoprene jacket; copper or aluminum conductors.

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Portable d-c and a-c thermo instruments for precision measurement of potentials and minute currents in electronics or laboratory research.

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For complex, or just routine measurement jobs, these and other specialized WESTON Instruments save time and assure dependable measurements. For information on the complete line, see your local Weston representative, or write . . . WESTON Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.

WESTON

Instruments

Industrial Circuit Tester – Model 785

A multi-range, multi-purpose, ultra-sensitive analyzer, for laboratory and industrial checking of electrical and electronic circuits. Has 28 practical scale ranges; measures d-c and a-c voltage, d-c and a-c current, and resistance. Accessories available to extend ranges. Compact and portable; furnished in either oak or steel case.

Model 901
Portable Test Instruments

Available in d-c, Model 901 –and a-c, Model 904, single and multiple ranges of wide coverage. Excellent scale readability and shielding. Accuracy within ½ of 1%.

A-C Clamp Volt-Ammeter

(Model 633, Type VA-1) For convenient and rapid measurement of a-c voltage and current without breaking the circuit. Jaws take insulated or non-insulated conductors up to 2" diameter. Safe, rugged, versatile. Also available as a-c clamp ammeter, without voltage ranges.

Sensitive Relays

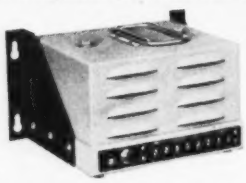
A line of sensitive relays including the Model 705 which provides positive operation at levels as low as ½ microampere. Non-chattering magnetic contacts handle up to 10 watts at 120 volts.

Panel and Switchboard Instruments

A complete line of instruments in all types, sizes and ranges required for switchboard and panel needs . . . including d-c, a-c power frequencies and radio frequency, rectifier types and D.B. meters.

Model 697 Volt-Ohm-Milliammeter

One of a line of pocket-size meters, Model 697 combines a selection of a-c and d-c current, and resistance ranges. Ideal for maintenance testing and many inspection requirements.



Model 1411 Inductronic D-C Amplifier

Stable amplifier provides high degree of resolution even at fractional loads. Reaches steady full scale deflection in a fraction of a second. Interchangeable plug-in range standards for either microamperes or millivolts.

Model 686
Electronic Tube Analyzer

Tests tubes under exact operating potentials. Accurately determines true mutual conductance of all tubes, in accordance with manufacturers' rated operating conditions, or under special operating conditions.

High Frequency Electronic Analyzer
Model 769

A three-in-one instrument providing a self-contained Volt-Ohm-Milliammeter, a high impedance electronic D-C Volt-Ohmmeter, and a probe type Vacuum Tube Voltmeter for use to 300 megacycles. Exceptionally stable and accurate. Has specially designed extremely small RF and D-C probes.

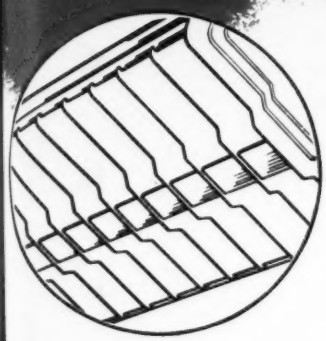
HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA GRAYBAR

Distributed by Graybar

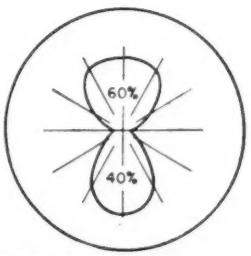
Years Ahead **IN DESIGN**

Wheeler FLO-LINER

THE NEWEST ADVANCE IN FLUORESCENT LIGHTING FIXTURES FOR SCHOOLS, OFFICES, STORES AND PUBLIC BUILDINGS



Tomorrow's fixture *today* — the new Wheeler FLO-LINER combines high efficiency and smart styling with unique maintenance ease and economy. When detached, louver assembly is automatically suspended below channel by supporting chains — allows quick, easy access to operating equipment. Amazingly flexible — 2 lamp and 4 lamp units available for both single pin and bi-pin lamps!



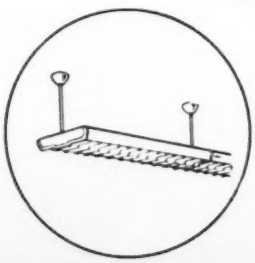
45° CROSSWISE SHIELDING — provided by the unique use of a plastic center panel which gives comfortable shielding to this shallow, smartly styled unit.

85% EFFICIENCY — translucent plastic side panels and center panel give low brightness for more comfortable seeing and high efficiency. For further seeing comfort, 51% of the light is directed above the horizontal and 34% below.

Write for special **FLO-LINER** *bulletin*

Wheeler

Distributed Exclusively Through Electrical Wholesalers
WHEELER REFLECTOR COMPANY
275 Congress Street Boston 10, Massachusetts
REPRESENTATIVES IN PRINCIPAL CITIES



EASILY JOINED — in continuous rows by simply joining ends together with two screws which are supplied. Units may be suspended from pendant stems or attached directly to ceiling.

HERE'S ANOTHER QUALITY PRODUCT AVAILABLE VIA **GRAYBAR**

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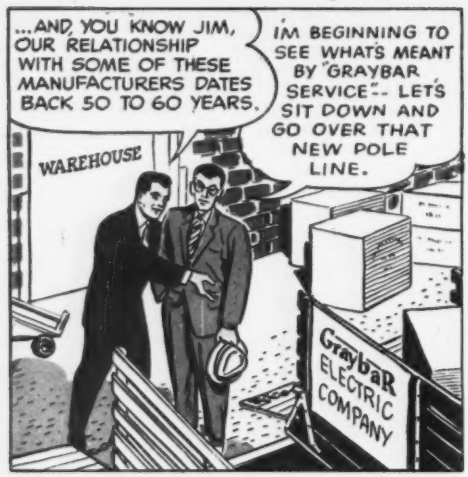
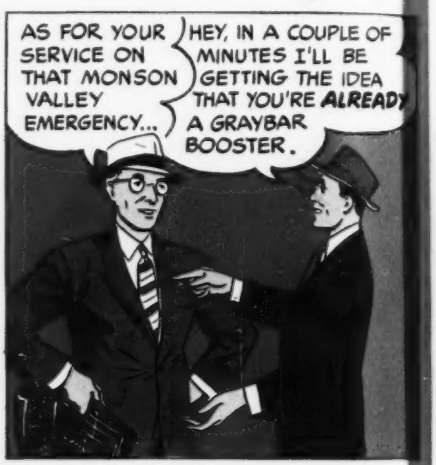
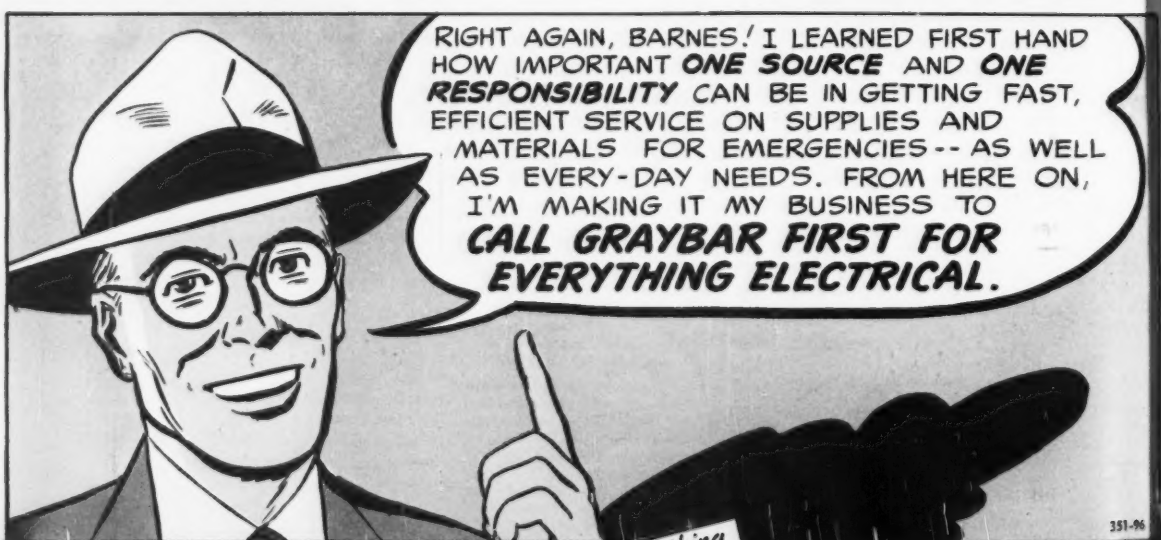

...AND YOU KNOW JIM, OUR RELATIONSHIP WITH SOME OF THESE MANUFACTURERS DATES BACK 50 TO 60 YEARS.
I'M BEGINNING TO SEE WHAT'S MEANT BY "GRAYBAR SERVICE"-- LET'S SIT DOWN AND GO OVER THAT NEW POLE LINE.
WAREHOUSE
GraybaR ELECTRIC COMPANY

JUST GETTING ALL THIS STUFF "ON-SCHEDULE" MAKES A BIG DIFFERENCE...AND I SURE APPRECIATE THE HELP OF YOUR GRAYBAR OUTSIDE CONSTRUCTION SPECIALIST.

BUYING HARDWARE PLUS PRE-FABRICATED POLES AND CROSSARMS--ALL AS A "PACKAGE" TO OUR OWN SPECIFICATIONS-- IS A BIG TIME-SAVER, TOO.


AS FOR YOUR SERVICE ON THAT MONSON VALLEY EMERGENCY...
HEY, IN A COUPLE OF MINUTES I'LL BE GETTING THE IDEA THAT YOU'RE ALREADY A GRAYBAR BOOSTER.


RIGHT AGAIN, BARNES! I LEARNED FIRST HAND HOW IMPORTANT ONE SOURCE AND ONE RESPONSIBILITY CAN BE IN GETTING FAST, EFFICIENT SERVICE ON SUPPLIES AND MATERIALS FOR EMERGENCIES -- AS WELL AS EVERY-DAY NEEDS. FROM HERE ON, I'M MAKING IT MY BUSINESS TO CALL GRAYBAR FIRST FOR EVERYTHING ELECTRICAL.
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GraybaR Everything Electrical GraybaR ELECTRIC COMPANY

IN OVER 100 PRINCIPAL CITIES

BOOK REVIEWS

Electrical Theory

Elements of Electricity. **4th Edition. By William H. Timbie assisted by Alexander Kusko. Published by John Wiley & Sons, Inc., New York 16, N. Y. 636 pages, illustrated. Price $5.50.**

Familiar in its earlier editions to several generations of engineering students, this well-known text book has now been revised to reflect the tremendous growth of electrical engineering. New illustrations derive from modern practice, and space is given to electronic and electrostatic devices. Aluminum wire, ceramic capacitors, transistors, radar, television, dry and gaseous rectifiers are included. And the sections on circuit analysis, direct current machinery, electro-chemical processes, and gaseous conduction have been clarified.

Written originally as a text for engineering students, this book is now offered in its 4th edition. It is probably as suitable for undergraduate instruction today as it has been for many years past. And engineers who find need to review their basic theory should benefit by its clear presentation.

Control

Electric Control Systems. **Third Edition. By Richard W. Jones. Published by John Wiley & Sons, Inc., New York 16, N. Y. 522 pages, illustrated. Price $7.75.**

The engineering background of control systems is well presented in this book. Motor drives are the primary consideration, but the material is so presented as to be useful for other applications. A few simple feedback systems are included as a background for more advanced work in this field.

Developed from experience teaching college seniors, the book is written as a text for this purpose. Pre-requisites are knowledge of circuit theory, electric machinery, electronics, and linear differential equations. Problems and questions at the end of each chapter direct thought to additional concepts beyond the text, and the bibliographies assist outside study.

This book appears well suited for college use. But practicing engineers who find need for study of control systems should find it a valuable aid.

Physics

Physical Formulae. By T. S. E. Thomas. Published by John Wiley & Sons, Inc, New York 16, N. Y. 121 pages. Price $2.00.

One of Methuen's Monographs on Physical Subjects, this little pocket book combines in one volume a selection of the principal mathematical laws and formulae of classical Physics. Included also is a section on mathematics and statistics. Of obvious value to students in engineering colleges, this book should be useful also to utility engineers interested in statistics and research.

Preserving Wood

Wood Preservation. **By G. M. Hunt and G. A. Garrett. Published by McGraw-Hill Book Co, Inc, New York 36. 417 pages, illustrated. Price $7.50.**

First edition (1938) has been brought up to date with new processes and new experience. Decay and insect enemies are detailed and so are the properties and limitations of numerous preservatives. Also discussed in detail are the preparation for and techniques of preservative treatment. Of particular interest is the subject of incising to achieve better penetration in the face of factors that retard penetration, absorption and retention. Unfortunately the book has little data on the life economics of treated poles.

Air Conditioning

Willis Haviland Carrier—Father of Air Conditioning. **By Margaret Ingels. Published by Doubleday & Co, Inc, New York, N. Y. 170 pages. Price $2.50.**

Less a definitive biography of Dr. Carrier than a record of his achievements in the beginning and growth of the Carrier Corporation, this book details the development of air conditioning as a branch of engineering. It is a record, readably compiled, of Dr. Carrier's inventions, discoveries and pioneering in what, before his time, was a little-known field. About one-third of the book consists of a "chronological table of events which led to modern air conditioning" which starts with Leonardo da Vinci in the 16th century and ends with the status of the industry in 1952.

Motion Pictures

The Handbook of TV and Film Technique. **By Charles W. Curran. Published by Pellegrini & Cudahy, New York 22, N. Y. 124 pages, illustrated. Price $3.00.**

This book was prepared to assist those faced with the preparation of live-action live-sound motion pictures. Requirements for projection differ from those for TV, hence both are included. The general technical background of the photographic techniques are described, as well as those by which sound is added to the film. Copious illustrations augment the text.

Sufficient cost information is provided to assist the layman in estimating production cost. And an extensive glossary of motion picture nomenclature enable him to properly interpret the terminology.

This book should be helpful to utility publicity personnel and engineers who use motion pictures for advertising or documenting construction projects.

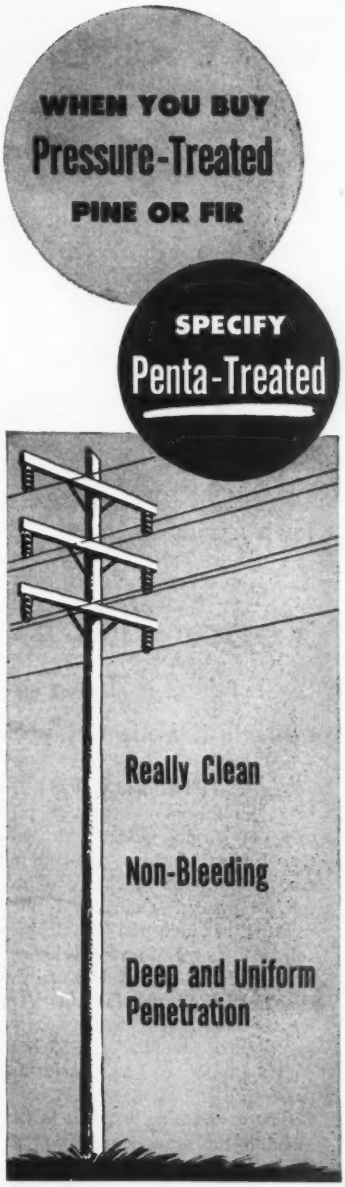
Control Systems

Electric Control Systems, Third Edition. **By Richard W. Jones. Published by John Wiley & Sons, Inc., New York 16, N. Y. 522 pages, illustrated. Price $7.75.**

This book has been developed as a text on motor control for senior engineering students. It starts appropriately with a survey of the operating characteristics of the common types of d-c and a-c motors. Then follows a chapter on electromagnetic contactors. Electronic switching devices and circuits are analyzed, followed by dynamo-electric amplifiers and saturable reactors.

The second half of the book is devoted to control circuits. Conventional relays are used in many combinations for motor starting, stopping, reversing and protection. Several methods of speed control are presented, including electronic and feedback, followed by plugging and braking.

Copious illustrations make this book easily read, and an extensive bibliography offers guidance to those who require more specific information. Utility engineers concerned with plant design and operation should find this an excellent study and reference book on motor application and control. And power salesmen should find it equally helpful in assisting with customers' applications.



It will pay you to specify Penta treatment. Write for names of companies near you supplying PENTA-treated poles and cross-arms.

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CHAPMAN®

Penta Preservative

Conforming to A.W.P.A. Specifications P8 and P9

NEWS ABOUT PEOPLE

TOM D. FULFORD

WALTER I. DOLBEARE

Vepco Fills Executive Posts

Fulford is elected vice president in charge of sales and Dolbeare is made vice president of area development

Tom D. Fulford and Walter I. Dolbeare have been elected vice presidents of Virginia Electric & Power Co. Fulford, formerly general sales manager, will be in charge of sales for the system. Dolbeare, formerly director of industrial development, will have charge of area development.

A graduate of the University of Cincinnati, Fulford joined the Vepco organization in 1926 as division sales manager in Norfolk. In 1933 he assumed the post of general sales manager with Puget Sound Power & Light Co, returning to Vepco in Richmond in the same capacity in 1937. Since then, he has been in charge of sales throughout the Vepco system.

Fulford is currently chairman of the merchandising committee of the Edison Electric Institute.

Was Illuminating Engineer . . . Dolbeare, a graduate of Brown University, has been affiliated with Vepco since 1927 when he joined the company as illuminating engineer. During the past 25 years he has served in various capacities in sales work and as manager of the former Williamsburg and Suffolk districts of the company. In recent years he has been director of industrial development.

Dolbeare served as a commander with the Navy in the Pacific during World War II, returning to Vepco in 1946 after a five-year tour of duty.

Dr Hector John MacLeod, dean of Applied Science at the University of British Columbia, Vancouver, will retire this summer after 17 years on the UBC staff. Dr McLeod came to UBC in 1936 to become head of the department of mechanical and electrical engineering. He was appointed dean of the engineering faculty in 1950 and continued also as head of the electrical engineering department. He also served as technical advisor to the Public Utilities Commission from 1939 to 1944.

Tom Birdsong, head of Alabama Power Co's Industrial Development Division since 1951, has relinquished his responsibilities because of ill health. Birdsong, with the company since 1935, has accepted the post of industrial power representative for the Western Division with headquarters in Tuscaloosa.

Hammond Fowler, a member of the Tennessee Railroad and Public Utilities Commission, has been appointed chairman of the commission to succeed **J. B. Avery, Sr,** who has resigned. **Cayce L. Pentecost** was named to the post formerly filled by Fowler.

New Orleans PS Elects 2 VPs

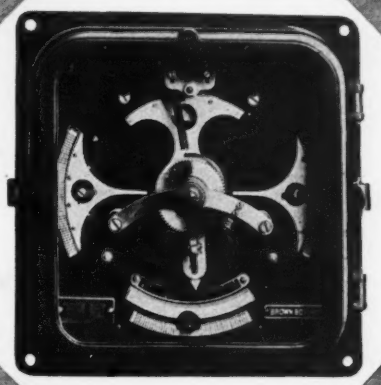
CLAYTON L. NAIRNE

Clayton L. Nairne, general superintendent of operations for New Orleans Public Service, Inc, has been elected a vice president of the company. Lionel J. Cucullu, chief engineer, has also been elected a vice president.

Nairne, a graduate of Tulane University's College of Engineering, was first employed by New Orleans PS as a student engineer during 1924 and 1925. In 1928, after three years' experience as an engineer with Florida Power & Light Co, he rejoined New Orleans PS. In 1943 he was named assistant to the vice president in charge of operations and, in 1951, he was appointed general superintendent of operations for New Orleans Public Service.

Handled Power Sales . . . Cucullu, who graduated from Louisiana State University in 1927, joined the utility in 1930. He subsequently became director of power sales, director of power and gas sales, power engineer,

INSTALLED in 1927 ... and



until it was returned for the first time to the factory shops for minor servicing in 1953, it required no maintenance other than periodical "air dusting".

Still going Strong!

While this may appear remarkable, it is not unusual. Brown Boveri Generator Voltage Regulators are installed and promptly forgotten . . . because they can operate for long intervals with no maintenance.

Its record in a Pennsylvania Power Plant is typical of the trouble-free service users get from . . .

BROWN BOVERI GENERATOR VOLTAGE REGULATOR

GET THE FACTS about these remarkable voltage regulators for AC or DC service. Precision built. Completely self-contained, no auxiliary units. From 1 to the highest kVA outputs. FAST DELIVERY — 1 MONTH OR LESS. SEND FOR DATA, TODAY!

BROWN BOVERI CORP.
19 Rector St., New York 6, N. Y.

BROWN BOVERI

Another new development using

B. F. Goodrich Chemical *raw materials*

Motor starter unit made by The Clark Controller Company, Cleveland, Ohio. Hycar rubber-phenolic compound supplied by Durez Plastics & Chemicals, Inc., North Tonawanda, New York. B. F. Goodrich Chemical Company supplies the Hycar rubber only.

Add Hycar ...Subtract Breakage!

IN testing experimental models of the heavy-duty, 4-pole magnetic motor starter pictured, breakage sometimes occurred with the contact arms.

This was a job where Hycar American rubber could help, as it has on so many similar problems. Hycar was added to the phenolic resin molding compound. It provided the required impact strength and shock resistance. The experimental contact arms worked perfectly—breakage was eliminated. Full-scale production was started.

But Hycar does even more. It also provides high dielectric strength; the molding compound is electrically safe.

Hycar-phenolic compounds are noted for their exceptional shock-resistance —2 to 5 times that of conventional phenolic compounds. They simplify operations, too. In processing, they provide good molding characteristics . . . easy flow in the mold . . . resistance to cracking around metal inserts in the part.

Hycar is highly versatile. It is used as a modifier for phenolic resins . . . as a base material . . . as an adhesive base . . . as a latex for coating or impregnating. Perhaps one of the many Hycar compounds can help you improve or develop more saleable products. We'll help with technical advice. For information, please write Dept. GJ-6, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B. F. Goodrich Chemical Company
A Division of The B. F. Goodrich Company

Hycar
American Rubber

GEON polyvinyl materials • HYCAR American rubbers • GOOD-RITE chemicals and plasticizers • HARMON colors

LIONEL J. CUCULLU

and assistant to the chief engineer. He became chief engineer of New Orleans PS in 1951.

White Engineering Elects Ford Kurtz President

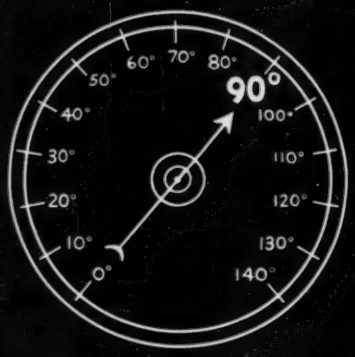
J. G. White Engineering Corp, New York, has elected Ford Kurtz president and Edward N. Chilson chairman of the board to succeed the late Gano Dunn, who held both positions (EW, April 20, p 206).

In other appointments, Robert H. Barclay, manager of the engineering department since 1950, was elected vice president in charge of engineering and Harold P. Jackson, manager of the construction department since 1941, was named vice president in charge of construction.

Kurtz has been vice president in charge of engineering since 1949 and Chilson a vice president since 1923.

FORD KURTZ

SAFE . . .



Low Temperature Purification!

By dehydrating insulating oil at low temperatures by means of De Laval Insulating Oil Purifiers, oil is produced that is safer to use than that maintained by methods demanding relatively high heat to drive off moisture.

Low temperature purification prevents rapid reduction in dielectric strength of the oil after purification. Another advantage of low temperature purification by De Laval centrifugals is that the probability of condensate forming in the receiving tank is eliminated.

De Laval Insulating Oil Purifiers are equipped with low watt density electric heaters which prevent carbonization of the oil. Heating costs are kept to a minimum.

THE DE LAVAL SEPARATOR COMPANY
Chicago POUGHKEEPSIE, N.Y. San Francisco

DE LAVAL

INSULATING OIL PURIFIERS

PROOF OF *Industrial Monkey* ACCEPTANCE

UTILITIES TEST...ORDER MORE

Virtually every major utility firm to purchase an INDUSTRIAL MONKEY has ordered more units *within a year!* No greater proof of the INDUSTRIAL MONKEY'S high equipment value can be offered.

The INDUSTRIAL MONKEY — a hydraulically operated telescoping boom with a self-leveling work platform — speeds up work four to five times and rapidly pays for itself in reduced operating costs.

One of Pacific Power & Light Company's new INDUSTRIAL MONKEYS (model ML) quickly positions workman so he can help string conductors over "hot" secondaries.

The Industrial Monkey Cuts the High Cost of High Work

- Foot-controlled— both hands free for work.
- 60 feet — ground-to-working-height.
- Works from horizontal to vertical within 270° arc.
- Worker protected against 24,000 volts.
- Safe — dual controls.

Put INDUSTRIAL MONKEYS to work in your operation....For "Proof-of-Acceptance" facts call, wire or write today.

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1113 SPRING ST. N. W., ATLANTA • 2730 SAN PABLO AVE., BERKELEY

RAY W. BRASWELL

Mississippi P&L Elevates Braswell to Vice President

Ray W. Braswell, general superintendent of Mississippi Power & Light Co for the past six years, has been promoted to the post of vice president of the utility. In his new position, Braswell will serve as operating manager and will co-ordinate operations activities throughout the company's service area.

Braswell has about 26 years' experience in the utility field. After receiving his degree in electrical engineering from Washington University, St. Louis, he joined Louisiana Power & Light Co. During his 20 years with that utility he filled a number of executive positions. He was assistant to the chief engineer when he went to Mississippi P&L six years ago.

•

Karl M. Bausch, chief electrical engineer of the Refinery Division of Bechtel Corp, San Francisco, has been promoted to chief electrical engineer of the firm's Power Division. He will direct electrical engineering on Power Division projects, mainly in the fields of steam and hydroelectric generating plants and electrical transmission and distribution systems.

Roy J. Davidson has retired as chief distribution engineer for Pacific Power & Light Co after 40 years' service with the company.

A. George Rogers, assistant division manager of Westinghouse Electric Corp's Television Radio Division, Metuchen, N. J., has been made man-

EASIER SERVICING

Another reason why most control center buyers specify WESTINGHOUSE

Give a man a screw driver and he's all set to go to work on a Westinghouse Control Center. With this simple tool he can open unit doors, remove and replace units, disassemble units, wire units and wire complete vertical structures. And all he needs is ONE screw driver because all screws and parts are accessible from the front.

All men go for the fact that removing and replacing starter units is positive and not a matter of "feel and twist". Guide rails, located on either side of each starter unit, make this a positive operation . . . as simple as opening and closing a filing cabinet drawer.

Then there are those operations that can be performed right on the structure. Each unit can be pivoted forward to the tilt-out disconnect position where it is completely disconnected from the power buses and is "dead".

What about your control center problem? Call in your local Westinghouse application engineer. He will help you work out the details to meet your specific needs. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-27022-A

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for galvanized towers from a

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There's no better anti-corrosive pigment for painting over galvanizing than active suboxide of lead—the basic pigment in Subox and Subalox paints.

There's no surer way to get economical and effective preservation of galvanized structures than by coating them with Subox or Subalox. In most instances, a single coat is sufficient and Subox or Subalox—will not chip, crack or blister during years of exposure to the elements.

What's more, repainting is simpler and more economical when these paints are used. They cost no more than any good paints, and can be relied on to save you money for years.

Write for a free copy of "Paint Galvanized Transmission Towers for Long Life".

Subox Inc. 3 FAIRMOUNT PLANT HACKENSACK, N. J.

ager of operations for the division. He succeeds **F. M. Sloan,** recently named manager of the company's Lamp Division.

MURRAY JOSLIN

Joslin Is Elected a VP; Ward Gets New Duties

Murray Joslin, assistant to the board chairman of Commonwealth Edison Co, has been named a vice president of the utility. He will be in charge of the activities previously under Vice Pres J. Harris Ward's supervision.

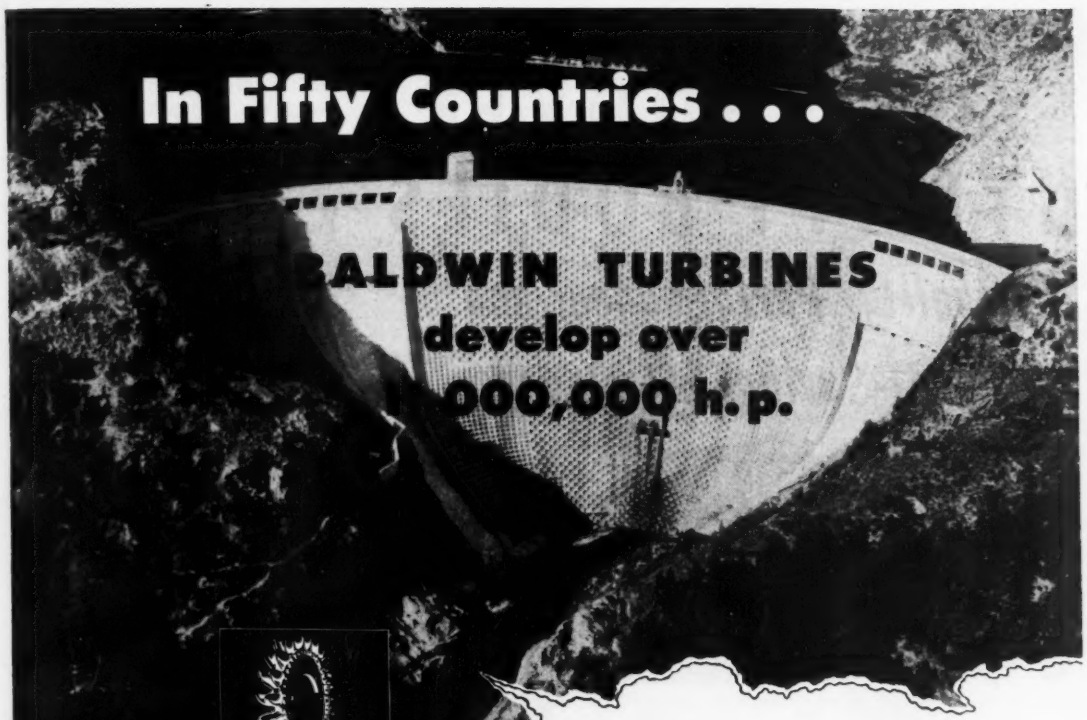
Ward has been placed in charge of all commercial and sales activities of the Edison system, including the Public Service Co Division. In taking over his new duties, Ward will relinquish the position of treasurer. D. Robert Bower, formerly assistant vice president, has been elected treasurer.

•

L. S. Houk, director of works engineering for Westinghouse Electric Corp's Headquarters Manufacturing Division, has been named to the newly created position of manager of manufacturing for consumer products of Westinghouse. He will be responsible for manufacturing functions throughout the company's Consumer Products Divisions, which include electrical appliances, television and radio, lamps, and electronic tubes.

Bernard T. Svihel has been placed in charge of the newly established Electronics Division of Kuljian Corp, Philadelphia, which is an outgrowth of the corporation's pioneering work in electronic controls for power plant

In Fifty Countries . . .



BALDWIN TURBINES develop over 10,000,000 h.p.

No matter what your power plant requirements might be, there are four important reasons why you should turn to Baldwin for the answer to your hydro-electric development problems:

1. Baldwin-Lima-Hamilton Corporation has at its disposal a wealth of experience dating back to the early days of the Pelton Water Wheel Co., a present Baldwin subsidiary, and the I. P. Morris Co. which manufactured its first turbine equipment in 1841.
2. They offer you a complete range of available capacities . . . small, fractional horse power water wheels to the largest units that can be shipped.
3. Since their line includes all four basic types of turbines (at left), Baldwin engineers can make an unbiased recommendation of the type best suited for your conditions and needs.
4. Baldwin and Pelton can supply other hydraulic machinery: surge suppressors; butterfly, needle, spherical and relief valves; large capacity low head pumps.

You'll enjoy and profit from reading Baldwin Bulletin 1000 which devotes all 24 pages to pictures and data on typical Baldwin turbine installations. Please write to Dept. 5007, Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pa.

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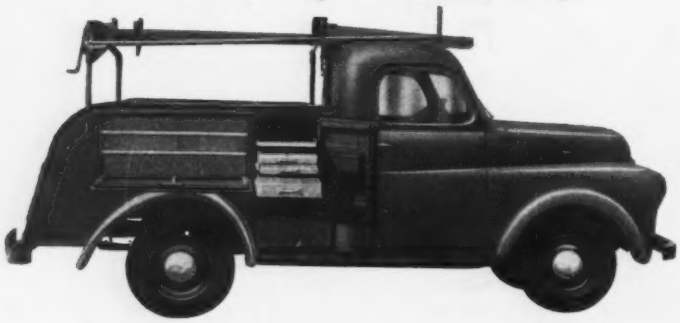

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PERFORMANCE . . . because each York-Hoover Body is specifically engineered for the job to be done. This, together with the factors of stability, minimum weight, ease of maintenance, and the ability to "take it" in everyday service, makes York-Hoover Utility Bodies the best buy for you.

COST-SAVING EFFICIENCY . . . is the end result . . . the reason why for over 60 years customers from coast to coast have relied on York-Hoover Equipment to give them top performance, low operating and maintenance costs. Enjoy all 3 in '53. Buy York-Hoover Utility Bodies!

York-Hoover Corporation
YORK, PENNSYLVANIA
Body Division

installations. Svihel, for six years a member of the electrical engineering staff at Massachusetts Institute of Technology, comes to Kuljian with over 15 years experience in the radio and electronics industry.

Lester H. Means, who has been headquartered for the past year in New York as regional manager of union relations for several of General Electric Co's major plants, has been appointed manager of employee and plant community relations for GE's Major Appliance Division, Louisville, Ky. Means, with GE for more than 29 years, succeeds **Carl M. Lynge,** who is retiring after more than 40 years' service with the company.

T. E. With has been named division manager of Ohio Power Co's Central Division to replace **R. C. Knapp,** who has retired because of ill health. With, who became associated with Ohio Power in 1926, has served for the last four years as assistant to Knapp. Knapp, who joined Ohio Power in 1924, was appointed division manager in 1949.

JOSEPH D. HOFFMAN

Gets New Executive Post

Joseph D. Hoffman has been named executive vice president of Hi-Voltage Equipment Co, Cleveland, a subsidiary of Joslyn Manufacturing & Supply Co. Prior to this appointment, he was affiliated with James R. Kearney Corp, St. Louis. Hoffman, who joined the Kearney corporation in 1928, served in the sales department before becoming vice president in 1938.

A man with a hate

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This personal sense of responsibility is inherent with C-O-TWO Fire Protection Engineers... a definite plus in your behalf. Whether its fire detecting or fire extinguishing ...portables or built-in systems... C-O-TWO means top quality backed by experienced engineering that results in operating superiority for you at all times.

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Don't take chances with your investment. Secure the benefits of highly efficient fire protection engineering today... our extensive experience over the years is at your disposal without obligation. Get the facts now!

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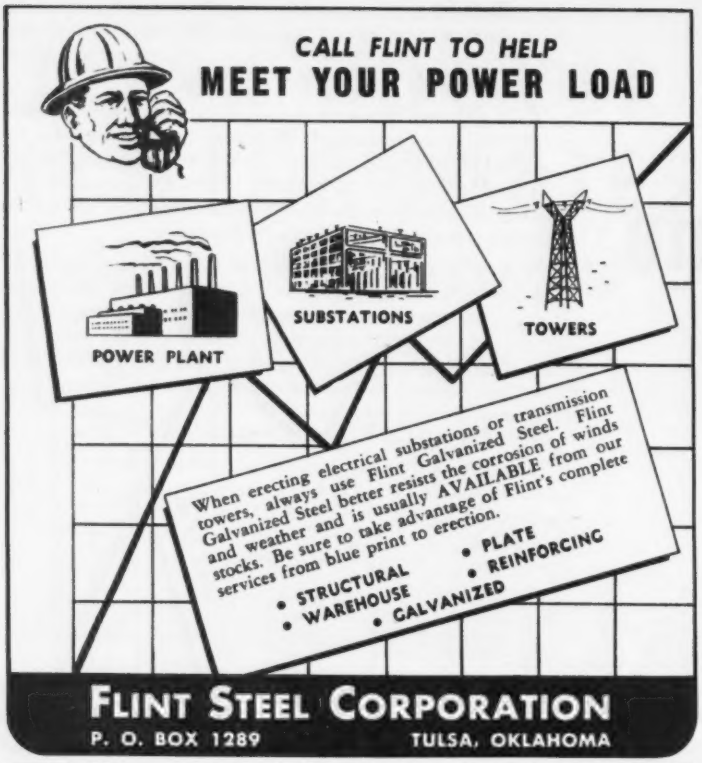
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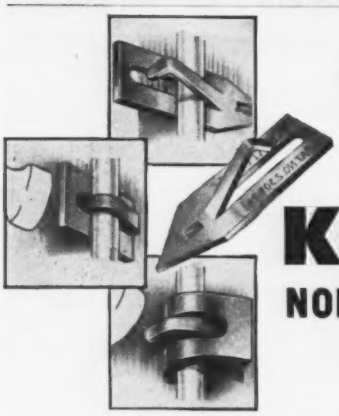

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For Better Construction - For Safer Maintenance

J. H. PENGILLY

New PCEA President

J. H. Pengilly, vice president and Western Division manager of Square D Co at Los Angeles, has been elected president of the Pacific Coast Electrical Association for the 1953-54 term. He succeeds Dunlap D. Smalley, a vice president of Pacific Gas & Electric Co.

•

William N. Fooshee has been named plant manager of the Clyde (Ohio) factory of Bendix Home Appliances Division of Avco Manufacturing Corp to replace **B. E. Brennan,** who has resigned. Fooshee, who has been manager of costs and methods at the Clyde plant, came to Bendix in 1944.

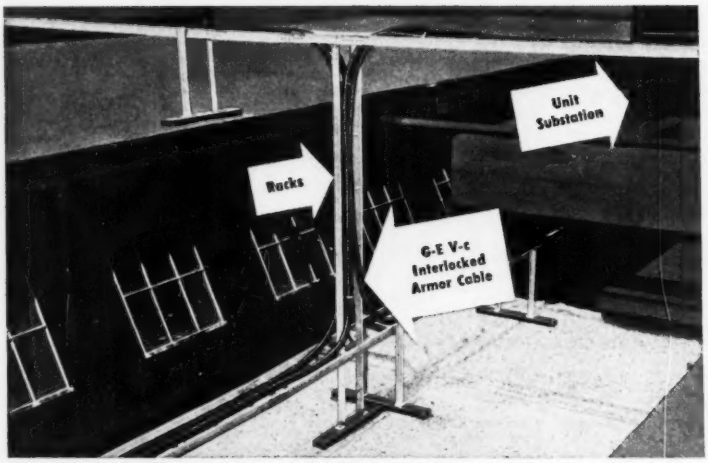
Elwood G. White, construction engineer in transmission and distribution in the Pueblo Division of Southern Colorado Power Co, has been made district manager of the utility's Canon City Division. He began with Southern Colorado Power in 1929.

OBITUARY

Harry E. Armstrong, 70, retired assistant secretary of Ohio Power Co, died May 24. Armstrong, who joined the company in 1900, also served as office manager at the Newark branch of Ohio Power. He retired in 1948.

John E. Tate, 66, retired Canton (N. C.) manager of Carolina Power & Light Co, died May 27. He had served the utility 44 years prior to his recent retirement.

Broken roof lines present no problem for the G-E V-c interlocked armor cable system



The G-E V-c interlocked armor cable system can be quickly installed by utilizing existing structures. This feature saves time and has helped many plants to maintain production during installation.

Installation speed important feature

To distribute power in a modernized plant, an eastern manufacturer used 12 G-E unit substations on the roof and then installed a G-E V-c interlocked armor cable system to bring high-voltage power to these substations. More than a mile of G-E V-c interlocked armor cable was used. The cable was 3-conductor #2/0, 15,000-volt, No. 1799 varnished-cambric-insulated with an over-all thermoplastic jacket and bronze armor.

Easier installation

The uneven contour of the buildings' roofs made an ordinary conduit installation extremely difficult. And underground duct work would have meant costly tearing up of concrete floors. Either of these methods also meant more installation time and more cost for materials.

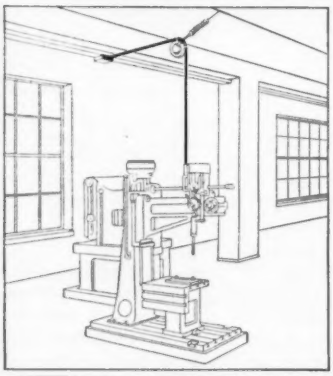
Racks used

Aluminum racks, only 12 inches wide, were used to carry the cable over the many rises, slopes, and bends on the roofs. Because the G-E V-c interlocked armor cable system is light and flexible, no difficulty was experienced in pulling long lengths by hand.

Readily available

G-E V-c interlocked armor cable on racks is always open for visual inspection — always accessible — quickly spliced with simple, mechanical joints. To our knowledge, no installation of G-E V-c interlocked armor cable has ever suffered mechanical damage sufficient to cause electrical failure.

For fast connections to plug-in type overhead buses



G-E Flamenol* bus-drop cable provides a fast, easy way to connect machine tools to low-voltage, overhead, plug-in type distribution buses. No conduit is needed. The cable is inserted into inexpensive watertight connectors at the bus and at the machine tool switchboard, and is supported by a cable loop as shown at the left.

The insulation and jacket on Flamenol bus-drop cable resist oil, grease, gasoline, acids, and alkali cutting fluids. This cable withstands severe mechanical abuse, and will not support combustion.

G-E Super Coronol cable passes 5½ year, 121 C test

Aging tests of G-E Super Coronol* cable held continuously under load at 121 C copper temperature have passed the 5½-year mark. This remarkable cable shows no sign of deterioration with both physical and electrical properties remaining stable after the 20th month. The tests are continuing and have enabled G. E. to raise the maximum rating of Super Coronol cable to 85 C copper temperature up to 8000 volts—80 C above 8000 volts.

HOW TO CHOOSE HEAT-RESISTANT WIRE AND CABLE

G. E. has prepared a useful booklet as an aid in the selection of Deltabeston* power cables, Types AVA, AVB, AVL. The booklet is free — Pub. No. 19-269-1.

*Registered Trade-mark General Electric Company

The next time you have a question on cable, call a G-E wire and cable specialist for prompt, expert help. You can reach him at the nearest G-E Construction Materials district office. Or, write Section W76-627, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

You can put your confidence in—

1878 75 1953 YEARS OF ELECTRICAL PROGRESS

GENERAL ELECTRIC

Orders and Open Manufacturing Capacity for Electrical Equipment, 1953-1956

Total Capacity Shipped and on Order and Scheduled for Shipment	1952	1953	1954	1955	1956	Total Scheduled for Shipment as of 4-1-53	New Capacity Scheduled 10-1-52 to 4-1-53	Capacity Shipped 10-1-52 to 4-1-53
LARGE STEAM TURBINE-GENERATORS* (10,000 Kw and Larger)[1]								
	(Shipped)							
For U. S. Utilities	7,152,200	10,937,900	12,022,900	7,529,700	233,000	27,983,700	7,076,300	4,768,800
For U. S. Industrials	707,500	665,000	199,800	.....	.....	615,900	202,800	474,400
For Outside Continental U. S.	260,000	325,600	192,500	110,000	.....	628,100	151,600	65,000
TOTAL	**8,119,700**	**11,928,500**	**12,415,200**	**7,639,700**	**233,000**	**29,227,700**	**7,430,700**	**5,308,200**
Estimated Open Capacity	.....	.....	250,000	5,600,000	13,200,000			
SMALL STEAM TURBINE-GENERATORS* (4,000 to 9,999 Kw)[1]								
	(Shipped)							
For U. S. Utilities	100,000	106,900	14,400	.....	.....	108,900	38,800	12,400
For U. S. Industrials	220,600	216,000	62,400	.....	.....	237,000	99,900	88,400
For Outside Continental U. S.	184,500	174,600	18,600	.....	.....	177,600	56,700	81,100
TOTAL	**505,100**	**497,500**	**95,400**	.....	.....	**523,500**	**195,400**	**181,900**
Estimated Open Capacity	.....	.....	800,000	1,400,000	1,400,000			
STEAM GENERATORS (450-Psi Pressure and Higher)[2]								
	(Shipped)							
For U. S. Utilities	83,965	87,774	75,336	10,510	.....	153,403	22,530	51,377
For. U. S. Industrials	26,984	22,094	3,890	.....	.....	20,029	4,426	11,912
For Outside Continental U. S.	8,523	11,567	2,545	.....	.....	11,815	3,351	3,841
TOTAL	**119,472**	**121,435**	**81,771**	**10,510**	.....	**185,247**	**30,307**	**67,130**
Estimated Open Capacity	.....	.....	60,000	170,000	185,000			
WATER-WHEEL GENERATORS (4,000 Kw and Larger)[1]								
	(Shipped)							
For U. S. Utilities	1,735,100	1,687,300	1,232,600	898,300	81,100	3,426,300	254,500	782,500
For U. S. Industrials	13,100	13,100	.....	.....	.....	.....	.....	26,200
For Outside Continental U. S.	204,500	248,800	250,000	37,100	.....	525,400	208,300	21,700
TOTAL	**1,952,700**	**1,949,200**	**1,482,600**	**935,400**	**81,100**	**3,951,700**	**462,800**	**830,400**
Estimated Open Capacity	.....	.....	600,000	1,800,000	2,700,000			
HYDRAULIC TURBINES (5,000 Horsepower and Larger)[3]**								
	(Shipped)							
For U. S. Utilities	2,434,600	2,136,000	2,811,200	1,844,500	796,400	7,719,200	1,973,200	1,474,100
For U. S. Industrials	16,700	16,800	.....	.....	.....	.....	.....	33,500
For Outside Continental U. S.	354,400	304,700	50,000	.....	.....	280,000	.....	255,100
TOTAL	**2,805,700**	**2,457,500**	**2,861,200**	**1,844,500**	**796,400**	**7,999,200**	**1,973,200**	**1,762,700**
Estimated Open Capacity	.....	.....	125,000	1,900,000	2,900,000			
POWER TRANSFORMERS* (501 Kva and Larger)[4]**								
	(Shipped)							
For U. S. Utilities and U. S. Industrials	42,111,000	54,544,000	40,832,000	10,987,000	256,000	94,899,000	22,769,000	22,201,000
For Outside Continental U. S.	1,528,000	1,278,000	909,000	132,000	.....	2,079,000	692,000	454,000
TOTAL	**43,639,000**	**55,822,000**	**41,741,000**	**11,119,000**	**256,000**	**96,978,000**	**23,461,000**	**22,655,000**
Estimated Open Capacity	.....	400,000	23,000,000	54,000,000	73,000,000			

[1] Figures in kilowatts [2] Figures in 1,000 lb steam per hr [3] Figures in horsepower [4] Figures in kilovolt amperes

* For 1952, nameplate rating; for 1953, 54, 55, 56, capability.

** In 1957, for U. S. utilities, 495,200, and estimated open capacity, 3,800,000

*** In 1957, for U. S. utilities, 25,000, and estimated open capacity, 73,000,000.

Power Equipment Makers . . .

. . . face a bright outlook as material situation improves and their facilities are expanded, EEI survey reveals

With the material situation greatly improved, manufacturers of heavy electric power equipment can now face a bright outlook. Although some items continue to present difficulties, most manufacturers are confident of being able to carry out their present schedules without serious delays. Expanded manufacturing capacity of manufacturers will make possible shorter delivery periods for some types of equipment.

All this is reflected in the 13th semi-annual electric power survey prepared by Edison Electric Institute. The report is based on figures and information supplied by 19 of the country's leading manufacturers of heavy electric power equipment as of April 1, 1953. These firms supply most of the heavy equipment used by utilities.

The EEI survey, which covers generators, hydraulic turbines, and transformers, contains data on shipments, production schedules, and the estimated open manufacturing capacity.

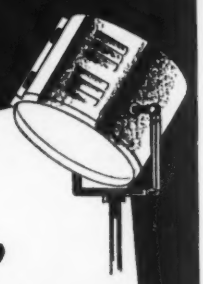
Estimates of open manufacturing capacity for the production and delivery of additional equipment are based upon the productive capacity of existing and expanding manufacturing facilities, assuming that production of equipment now on order will proceed as scheduled and that materials to support full shop operations will be available.

Guaranteed Capability Rating . . . This EEI report calls attention to the fact that for 1952 the data pertaining to all steam turbine-generators are based on nameplate rating of units, whereas for 1953 and later years, the data are based on guaranteed capability of the units.

Electrical manufacturers have

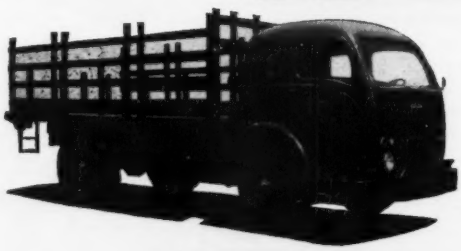
SPOTLIGHT on the

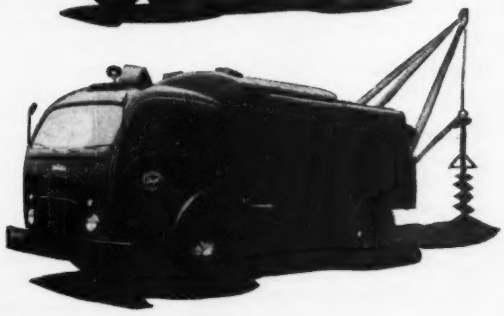
MOST USEFUL . . . MOST VERSATILE TRUCK

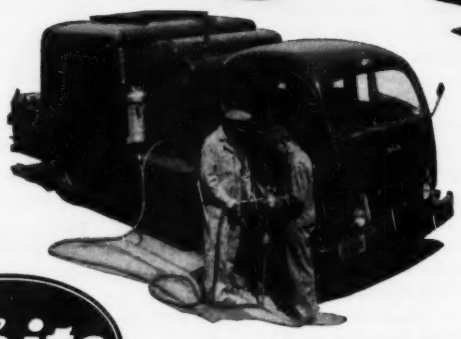


in the utility industry...

The WHITE 3000







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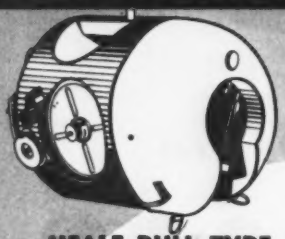

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scheduled for shipment approximately 37,257,600 kw of generators in 1953-1956.

A total of 32,216,400 kw of large steam turbine-generators (10,000 kw and larger) has been shipped or scheduled for shipment during the four years. Open manufacturing capacity for the large generating units is estimated at 19,050,000 kw. In 1954, the open capacity of 250,000 kw is available for the smaller units of conventional designs. For 1956, practically the full manufacturing capacity now estimated as 13,400,000 kw on the capability basis is available. Estimates are based on a six-day week now current in most electrical equipment manufacturing plants.

Small-Unit Demand Drops . . . The present schedule of small steam turbine-generators (4,000 to 9,999 kw) for 1953-1954 totals 592,900 kw. No shipments are presently scheduled beyond 1954. The trend towards larger units has limited the demand for the small units to an average of about 535,000 kw for the past five years. Estimated open manufacturing capacity is 3.6 million kw. Manufacturing capacity for small steam turbine-generators reaches the full value of 1.4 million kw per year in 1955.

Shipments of steam generators 450 psi and higher for 1953-1955 total about 213,716,000 lb per hr. The open manufacturing capacity is estimated as 60 million lb per hr for 1954 and 170 million in 1955. As yet, no shipments are scheduled for 1956, so that the estimated full manufacturing capacity of 185 million lb per hr is available.

About 4,448,300 kw of waterwheel generators (4,000 kw and larger) have been shipped or scheduled for shipment during 1953-1956. Estimated open capacity available in 1954 is 600,000 kw. This goes to 1.8 million kw in 1955 and to 2.7 million kw in 1956. Estimated full manufacturing capacity is about 2.8 million kw per year.

Full manufacturing capacity for the production of hydraulic turbines of 5,000 hp and larger is estimated at 4.3 million hp per year. For 1954-1956, open capacity totals 4,925,000 hp. The 125,000 hp capacity for 1954 is available for small units only. Large units can be furnished in 1955. Shipments of hydraulic turbines for the 1953-1956 period will be about 7,959,600 hp.

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It Pays to Know these brands

All guaranteed accurate length — accurate weight as marked.

Shipments of power transformers 501 kva and larger scheduled for delivery in 1953-1956 amount to 108,938,000 kva. The estimated open manufacturing capacity of 400,000 kva for 1953 covers small units of conventional design only. The 23 million kva available for 1954 includes larger sizes, but most manufacturers are quoting around 30 months for the very large units. Open capacity of 54 million kva for 1955 includes the full range of sizes. By 1956 the fully expanded manufacturing capacity estimated as 73 million kva per year becomes available.

MANUFACTURING BRIEFS

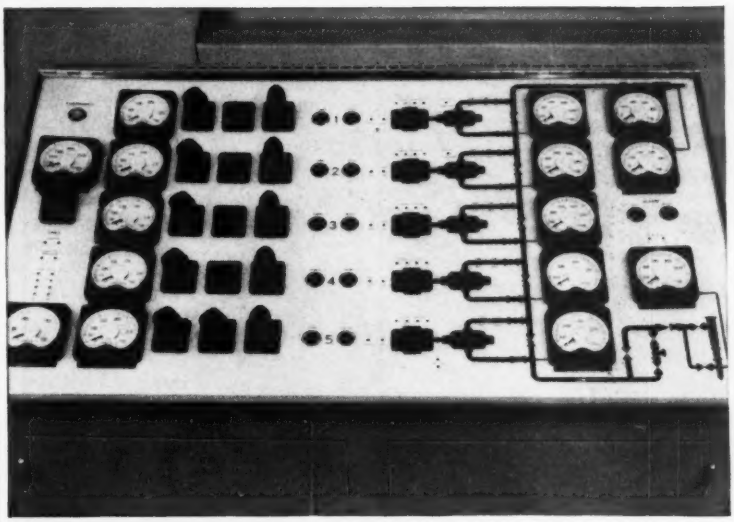
Westinghouse Electric Corp has submitted the lowest bid of $4,299,822 on four 67,000 kva generators for Chief Joseph Dam, Wash., in the second round on bidding for equipment for the project. English Electric Export & Trading Co, Ltd, which originally submitted the lowest bid for the generators, was second with a bid of $4,397,523 . . . An eight-year-old anti-trust suit was settled recently in a Trenton, N. J., federal court when Westinghouse agreed to end cartel agreements with two German companies—Siemens & Halske, A. G., and Siemens Schuckwerke, A. G. The government case accused Westinghouse and the German firms of dividing up world markets and exchanging patents and know-how relating to manufacture, sale and distribution of electrical equipment on an exclusive basis.

Aluminum, Ltd, has contracted to sell 786,000 tons of aluminum during 1953-1958 to Aluminum Co of America and Kaiser Aluminum & Chemical Sales, Inc.

Aluminum Co of America has liquidated Alcoa Mining Co, a wholly owned subsidiary, to simplify its corporate structure. The subsidiary's operations will be transferred to the newly created Mining Division of Alcoa. Alcoa Mining has been handling much of the mining of the bauxite ore Alcoa converts into primary aluminum.

Roller-Smith Corp, Bethlehem, Pa., manufacturers of circuit breakers, switchgear, instruments, and power

Easy-reading K-24 Instruments



Help you design revolutionary control systems

Alert engineers often bring us new problems in instrumentation. They've hit on a new way to use electrical instruments to improve their operations. We've helped work out many problems like these, and we would like to do this kind of thinking with you.

The photograph above shows what can be done. This desk controls a pipeline booster station. These Westinghouse K-24 instruments are connected to special strain gauges and are calibrated in psi to show *pressures* in the strategic parts of the pipeline system. This revolutionary arrangement eliminated the usual pressure tubing and permitted safer, centralized control of this station.

Notice how much more *readable* these Westinghouse K-24 instruments are than the usual types—from sharp angles and from distances. This is a big factor in modern control board design. And the smaller size and longer scales permit the designer to save space. A single operator can control more processes because he can read the instruments from one place.

Call in Westinghouse when you need instrumentation. And write now for booklet B-4695, "Getting A Full Measure". Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pennsylvania.

J-40429

This is the super-readable Westinghouse Full-View K-24 instrument, a triumph of optical engineering. You can read it at sharp angles, and from far away. Glare, shadows and parallax are almost non-existent.

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EVERYTHING YOU NEED IN METERS AND INSTRUMENTS

Don't just write—

Specify JENKINS

Gold Seal Tape

...and SAVE

Goes further—Here's why

GUARANTEED FOOTAGE— You get full measure with every roll. Tapes up tight to the last inch.

NO WASTE— Gold Seal Friction Tape tears evenly, won't ravel, molds to uneven surfaces.

HIGH DIELECTRIC— Less footage is needed per job. No pinholes; one thickness insulates.

LASTING "TACK"— Gold Seal sticks to the job under toughest conditions of cold and moisture.

EASY HANDLING— Gold Seal does not peel, dry out or smear the hands in hottest weather.

FRICTION and RUBBER TAPES in either 10-roll cartons or single rolls. Every roll sealed in cellophane, stays fresh. Jenkins Bros. (Rubber Division), 100 Park Ave., New York 17.

JENKINS

IT'S YOUR BEST BUY FOR PLANT SUPPLY

Jenkins Bros. make Diamond Seal Friction and Rubber Tapes which also meet ASTM Specifications.

switching equipment, has published a brochure marking its 50th anniversary. A free copy of the booklet may be obtained by writing to factory headquarters at Bethlehem.

Rome (N. Y.) Cable Corp's Los Angeles office and warehouse has moved from its Bay St. location into a modern new building at 2510 S. Malt Ave., East Los Angeles. The new building, which contains 14,000 sq ft, will permit the company to offer more efficient wire and cable service.

SALES ASSIGNMENTS

COMPANY STAFFS

Oliver Iron & Steel Corp's Pole Line Materials Sales Division has transferred C. Rea Guthridge to Chicago to assume the duties of Midwestern sales manager. Guthridge, former Ohio-Michigan district representative for the division, will supervise Pole Line Materials' activities in 13 Midwestern states. William C. Ridinger, formerly of the Pittsburgh office, succeeds Guthridge as district representative in the Ohio-Michigan territory.

General Electric Co's Apparatus Division has named E. S. Bjonerud manager of industrial sales in the San Francisco area. Bjonerud, who started with GE in 1922, formerly was assistant manager of industrial sales at San Francisco.

Allis-Chalmers Manufacturing Co's General Machinery Division has named Edward A. Rensch manager of the newly opened Des Moines (Iowa) Branch office. Rensch, who has been a sales representative in the Davenport district office, joined Allis-Chalmers in 1936.

Harnischfeger Corp, Milwaukee, has appointed Fred J. Hartley as special hoist representative for its southeastern territory covering Alabama, Georgia, South Carolina, Florida, Tennessee, Louisiana, Mississippi, and Arkansas. Hartley's headquarters will be in Birmingham, Ala.

Elliott Co, Jeannette, Pa., has made S. W. Crisman assistant district manager of its Pittsburgh office. Crisman, an electrical engineer, came to Elliott in 1935.

Appleton Electric Co has appointed John O. Bell, Jr, as district sales manager for the state of Texas with headquarters in Houston. For the past five years Bell has been with Appleton as a sales engineer in the southeast Texas territory.

A. O. Smith Corp, Milwaukee, has shifted R. J. Ulvestad from manager of Zone 1 in the Chicago office to sales manager of the newly created Central Zone at Kansas City, covering Missouri, Kansas, Iowa, Nebraska, Colorado, and Wyoming. G. C. Spratt, former sales representative in Zone 1, Chicago, becomes sales manager of the newly created zone at Indianapolis, covering Indiana, Michigan, western Kentucky, and western Tennessee.

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DUXSEAL®

plugs 'em quick and tight

DUXSEAL is a non-hardening adhesive plastic compound made with an asbestos base. It is the ideal general utility sealing and caulking compound for duct openings, potheads, bushings, terminal boxes, and for filling multi-wire contact boxes indoors. Use it like putty, just as it comes from the handy package, for smooth, workmanlike jobs.

Duxseal stays plastic—will not slump, melt or run under ordinary temperatures. Clings to duct walls and cables but flexes with expansion and contraction. It is unaffected by water and gases, does not react with rubber, metals or painted surfaces. For full information write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay St., Toronto 1, Ontario.

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SEALING COMPOUNDS

MEETINGS CALENDAR

***Edison Electric Institute**
Hydraulic Power Committee, Multnomah Hotel, Portland, Ore., June 15-16; Area Development Institute, University of Michigan, Ann Arbor, Mich., June 22-24; Transmission-Distribution Committee, Hotel Nicollet, Minneapolis, Minn. Oct. 8-9; Electrical Equipment Committee, Jung Hotel, New Orleans, La., Nov. 2-3.

American Institute of Electrical Engineers
Summer General Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 15-19; Pacific General Meeting, Hotel Vancouver, Vancouver, B. C., Sept. 1-4; Middle-Eastern District Meeting, Daniel Boone Hotel, Charleston, W. Va., Sept. 29-Oct. 1; Fall General Meeting, Muehlebach Hotel, Kansas City, Mo., Nov. 2-6.

Public Information Program
Mid-Atlantic Region, Safe Harbor, Pa., June 16; Workshop Conference Committee, Blackstone Hotel, Chicago, June 23; Steering Committee, Edgewater Beach Hotel, Chicago, Oct. 21; Workshop Conference, Edgewater Beach Hotel, Chicago, Oct. 22-23.

American Welding Society
Exposition held in conjunction with National Spring Technical Meeting, Shamrock Hotel, Houston, Tex., June 16-19.

American Society of Mechanical Engineers
Semi-Annual Meeting, Statler Hotel, Los Angeles, June 28-July 2; Fall Meeting, Sheraton Hotel, Rochester, N. Y., Oct. 5-7; Annual Meeting, Statler Hotel, New York, Nov. 29-Dec. 4.

American Society for Testing Materials
Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 29-July 3.

Electrical Equipment Representatives Association
Summer Meeting, Hotel Colorado, Glenwood Springs, Colo., July 15-17.

International Association of Electrical Leagues
18th Annual Meeting, Fairmount Hotel, San Francisco, Aug. 5-8.

Illuminating Engineering Society
National Technical Conference, Hotel Commodore, New York, Sept. 13-17.

Northwest Public Power Association
Accounting Section, Monticello Hotel, Longview, Wash., Sept. 17-18.

***Public Utilities Association of Virginias**
Annual Meeting, Greenbrier, White Sulphur Springs, W. Va., Sept. 17-20.

Rocky Mountain Electrical League
50th Annual Fall Convention, Broadmoor Hotel, Colorado Springs, Colo., Sept. 20-23.

International Association of Electrical Inspectors
Silver Jubilee Meeting, Edgewater Beach Hotel, Chicago, Sept. 21-26.

National Electrical Industries Show
Sponsored by Eastern Electrical Wholesalers' Association, 69th Regiment Armory, New York, Sept. 29-Oct. 2.

Interstate Power Club
Hotel Martinique, New York, Oct. 5; Hotel Martinique, New York, Dec. 7.

Electric League of Western Pennsylvania
4th Industrial Electric Exposition, William Penn Hotel, Pittsburgh, Oct. 6-8.

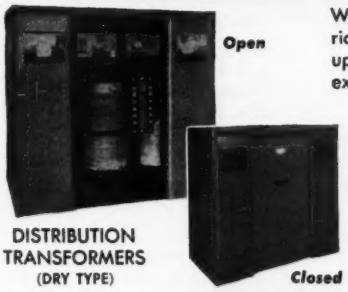
Association of Edison Illuminating Companies
Annual Meeting, The Greenbrier, White Surphur Springs, W. Va., Oct. 8-10.

National Association of Electrical Distributors
Fall Meeting, Pacific Zone, Hotel del Coronado, Coronado, Calif., Oct. 11-14.

Southeastern Electric Exchange
General Sales Conference, Atlanta Biltmore Hotel, Atlanta, Ga., Nov. 4-6.

*Addition this week.

WANT the BETTER* TRANSFORMERS?



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Here is a typical air-cooled 500 KVA class B type. 80°C Rise. 3 phase 4160 Delta Primary+ 2½% full capacity taps. 240x480 Delta Secondary. Available from 30 to 2500 KVA with voltages from 2400 to 15 KV.

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MEETS STANDARDS OF AIEE-NEMA

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Indoor or Outdoor
3 KVA to 15 KVA
Air-Cooled

WRITE FOR DETAILS

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TRANSFORMERS AND ELECTRICAL EQUIPMENT
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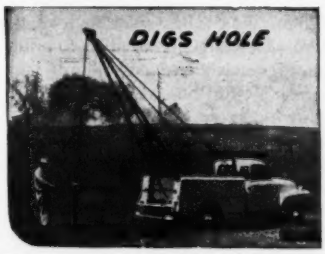


TEL-E-LECT "325" Attachment . . . Derrick and Digger Unit For ¾ and 1-TON TRUCKS

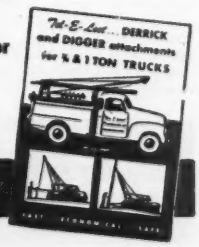
Why send a five man truck and crew on pole replacement or service jobs that can now be handled by two men and a highly portable ¾ or one ton service truck? The "325" attachment makes it possible for two men to set up the derrick, attach the digger, dig the hole and set the pole ready for tamping *in less than ten minutes!* This set-up, with or without radio communication, speeds up line work and cuts costs way down.

Write for Bulletin 325.

★ No more using five-man crews on two-man jobs

★ Sets poles up to 35'; take augers 8" to 20" diameter

★ Packaged unit for installation by your local mechanic



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THIS 64 PAGE BOOKLET SHOWS HOW YOU CAN

SAVE MONEY

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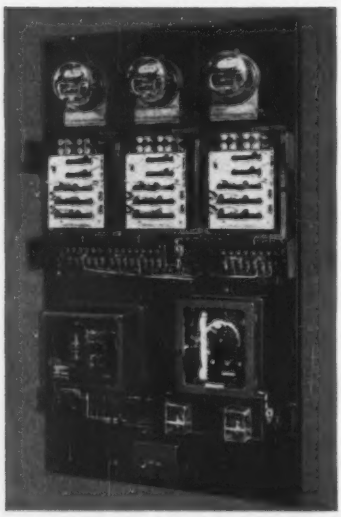
TRANSFORMER-LOSS COMPENSATOR

IT'S FREE!

Detailed, informative 64-page booklet explaining fully the operations, installation, varied applications of TESCO Transformer-Loss Compensators for Watthour and Varhour Meters! Contents include Loss Calculations, Sample Calculations, Test Procedure, etc. GET YOUR COPY TODAY!



HERE ARE TESCO Transformer-Loss Compensators on a two-element 6.6 KV 18,750 KVA metering installation with three transformer banks. Metering is compensated to the 66 KV dual service supply. Compensator and panel covers removed.

EASTERN

SPECIALTY COMPANY

PHILADELPHIA 40, PA.

Higher Rate of Return

(*Continued from page* 113)

of utility and manufacturing industries' additions to earned surplus over the period from 1937 to 1951 inclusive.

The manufacturing industry, which is regulated by competition, has increased its retained earnings measured in percent of net income nearly three times while the electric utilities only managed to increase theirs by one-third.

While it is not suggested that utilities retain 56% of their earnings the way the manufacturing companies do, it is equally clear that the present level of additions to surplus of utility companies is entirely too low. As the rise in the level of manufacturing surpluses is indicative of both the increased scope of industrial operations and of the inflationary pressures to which the whole economy is subjected, it is clear that there are no legal, economic, or moral reasons why the utility industry should not receive the same protection as do other segments of the American economy. In other words, the current level of surplus accretions in the utility industry, amounting to $163 million, should be raised to a minimum of $509 million in order to bring the "financial cushion" more into line both with the size of the electric utility industry and as an offset to the pressures of inflation.

Adjusted Rate of Return . . . In 1951 the rate of return on a net original cost rate base plus working capital amounted to 5.6% according to the Federal Power Commission. The adjustments which have been previously described, under the principle of maintaining the integrity of utility property, would raise the rate of return to an average of approximately 7.45% on an original cost rate base. Not only is this increase modest when applied to an historical rate base, but the same adjustment when related to a more realistic "three year average price" rate base would produce a rate of return of only 6.01%.

The foregoing analysis has confined itself only to evaluating the question of reserve accruals and additions to earned surplus, and, consequently, the rate of return does not reflect some of the other factors needed to arrive at adequate earnings in a period of inflation.

POWERCRAFT BUS SUPPORTS

• Available for prompt shipment from St. Louis, these bus supports conform to NEMA standards and have been used by many utilities and contractors. For indoor or outdoor service and for pipe or flat mounting.

Other POWERCRAFT Products

• Disconnecting Switches • Hook-Stick Operated • Indoor and Outdoor Types • Bus Clamps • Power Connectors • Pipe Frame Fittings for 1¼" I. P. S. Pipe.

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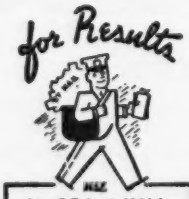
In view of present day difficulties in maintaining your own mailing lists, our efficient personalized service is particularly important in securing the comprehensive market coverage you need and want.

Ask for more detailed information today. You'll be surprised at the low overall cost and the tested effectiveness of thee hand-picked selections.



McGraw-Hill Publishing Co., Inc.

330 West 42nd St., New York 36, N. Y.

FINANCIAL

(*Continued from page* 124)

The supervisors rejected a previous proposal for a general increase in Hetch Hetchy rates and recommended the PUC adjust power rates for outside users but avoid a boost for San Francisco customers.

Although the city takes losses on supplying supplemental power to some customers, other more favorable contracts put the supplemental power operation as a whole in the black.

Denver Citizens to Vote on Utility Amendments

Denver voters in a special election June 16 will have a choice of two proposed charter amendments on the control of public utilities. One would place control in a municipal agency and the other would vest it in the Colorado Public Utilities Commission.

City Attorney John Banks said that in the event voters approve both proposals, the measure receiving the greatest number of "yes" votes would prevail.

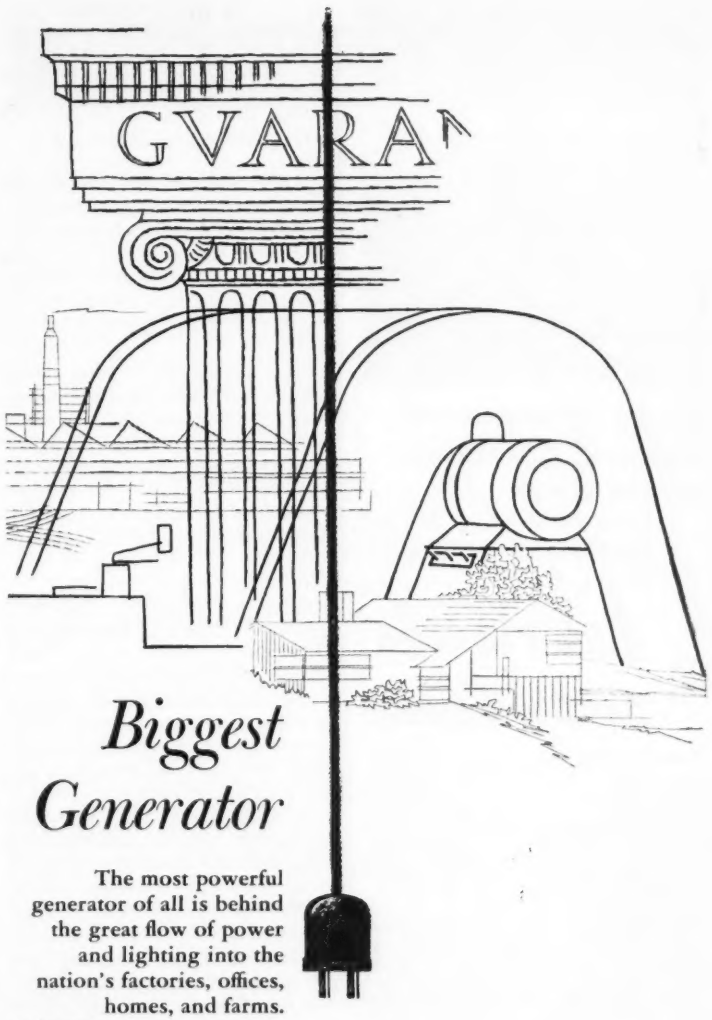
Because it is a home rule city, utilities in Denver have not been subject to control by the state Public Utilities Commission.

Electricity to Cost More In Southeastern England

London — (McGraw-Hill World News)—Five hundred thousand electricity consumers in Southeastern England will pay more as the result of the standardization of tariffs by the Southeastern Electricity Board, announced recently. The unit charge remains at a penny (approximately 1½ ¢), but one domestic tariff will be introduced on Jan. 1, 1954, to replace the 50 tariffs now used.

On the introduction of the new tariff, 323,000 consumers will receive credits amounting to $672,000, and 103,000 consumers will pay adjustment charges totaling $112,000.

The new tariff will apply to about 700,000 consumers, of whom 200,000 will pay less or the same as they are paying now, and 500,000 will pay more. The additional revenue from the new tariff will be $322,000 in the first year, and $532,000 annually after that.



Biggest Generator

The most powerful generator of all is behind the great flow of power and lighting into the nation's factories, offices, homes, and farms. Measuring its output not in kilowatt-hours but in terms of U. S. money, bank financing assists in energizing that broadening scope of uses for electricity and heating gas.

As long-time bankers to public utility companies, we have helped finance many phases of their expansive activities. Our knowledge is based on a broad experience.

Guaranty Trust Company of New York

Capital Funds $380,000,000

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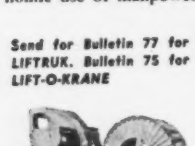
Leading Public Utilities find these heavy-duty, rugged SILENT HOIST machines dependable and efficient for the continuous, complex requirements of the transportation department, storage area, repair shop . . . in the movement of Generators and other heavy equipment, Cable, Wire, Maintenance Supplies, Poles and general equipment.

The LIFTRUK *Fork Lift Truck* and LIFT-O-KRANE *Combination Crane and Fork Lift Truck* handle capacity loads with maximum stability and safety. They have high lifting range. Make short turns in narrow spaces. Promote maximum efficiency for storage areas . . . and effect rapid inloading and outloading, with economic use of manpower.

Send for Bulletin 77 for LIFTRUK. Bulletin 75 for LIFT-O-KRANE



Makers of KRANE KAR Mobile Boom Crane, KARRI-GO Front Boom Crane, SILENT HOIST Cranes for Motor Truck Mounting, SILENT HOIST Winches and Capstans, SILENT HOIST Hydraulic Telescopic Truck Towers, etc.

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Pioneer Manufacturers of Heavy-Duty Equipment for Public Utilities and Municipalities

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Power Needs . . .

. . . of Missouri River region will increase 170% by 1970, MBIAC is informed

An increase of 170% in electric power production facilities will be required to meet the needs of the Missouri River region by 1970, according to a report submitted to the Missouri Basin Inter-Agency Committee last month by a subcommittee of the group.

The subcommittee, whose studies and research covered a period of nearly two years, reported that power requirements for "normal residential, commercial, and industrial use in the Missouri River region will increase from about 5,750,000 kw in 1952 to approximately 15,500,000 kw in 1970 . . ."

Step-Up in Facilities . . . The report emphasized that the anticipated 1970 requirements would call for a substantial step up in steam plant production by private utilities in addition to proposed output of federal hydroelectric plants at multipurpose dams being built under the Pick-Sloan program authorized by Congress.

In its conclusions, the report states that federal agencies concerned with river basin development program in cooperation with the states contemplate construction of about 70 hydro plants by 1970.

"These projects," it points out, "would supply approximately 2,750,000 kw of electric power for the December 1970 peak load. Disposition of this federal hydroelectric power will not be uniform throughout the region due to economic limitations on electric transmission distances, other cost factors, and power marketing policies adopted by the federal government. In 1970, for the assumptions of this report, the federal hydroelectric plants will supply proportions of the total estimated power requirements which, while averaging about 18% for the region as a whole, will vary from 0 in Kansas and 1.6% in the Missouri portion of the region to more than 90% of the total power requirements in the Wyoming portion of the region; and will average 46% of requirements for that portion of the region lying in the five-state area of Montana, North Dakota, South Dakota, Wyoming, and Nebraska."

How to keep informed on the "with what" part of your business

AT YOUR FINGER TIPS, issue after issue, is one of your richest veins of job information—advertising. You might call it the "with what" type—which dovetails the "how" of the editorial pages. Easy to read, talking your language, geared specifically to the betterment of your business, this is the kind of practical data which may well help you do a job quicker, better—save your company money.

Each advertiser is obviously doing his level best to give you helpful information. By showing, through the advertising pages, how his product or service can benefit you and your company, he is taking his most efficient way toward a sale.

Add up all the advertisers and you've got a gold mine of current, on-the-job information. Yours for the reading are a wealth of data and facts on the very latest in products, services, tools . . . product developments, materials, processes, methods.

You, too, have a big stake in the advertising pages. Read them regularly, carefully to keep job-informed on the "with what" part of your business.

McGRAW-HILL PUBLICATIONS

More Cooperation . . . The subcommittee concluded that power from federal hydro plants and from thermo-electric plants either existing or proposed for construction by non-federal power suppliers would be adequate to meet the future energy needs of the region. But, it noted, there is now and will be an increasingly greater need in the future for a high degree of cooperation between the federal and non-federal utilities, and among the non-federal utilities themselves, in order for the most economical sources of power to be made available and properly integrated in time to serve adequately the region's economy and the national economic structure to which it lends support.

Heading the subcommittee which drafted the report was Kenneth G. Tower, regional engineer for Federal Power Commission. Assisting him were representatives of federal and state agencies and public and private utilities.

Utility and Power District Dispute Service Areas

Phoenix, Ariz., is caught in the crossfire of a utility fight between Arizona Public Service Co and Salt River Power District as to which shall provide electricity to areas now in the city.

Public Service is franchised to operate in the city and has proposed increasing the franchise tax to 2% under a proposed 25-year contract now under consideration. This would amount to $100,000 or more yearly to the city.

The Power District holds a state franchise to operate in the valley area around Phoenix, but pays no city tax.

In 1928 the two utilities divided the valley into areas each would serve and this is the point at issue in the present disagreement.

Public Service was granted the right to serve residents of the city as it then existed and as its boundaries should expand.

Now the city has mushroomed into territory served by the Power District which has operated in the affected areas for 25 years.

The Power District is willing to pay the city a sum in lieu of a franchise tax provided the city meets certain conditions protecting Power District rights. When the city expanded into

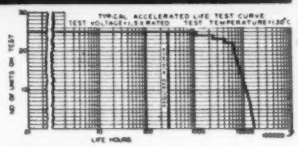
Further Proof of

Getting to the bottom of things

. . . is most clearly demonstrated by what we are doing every hour of every day — year in and year out — to make a finer fixed CAPACITOR.

One of the many things you as users are interested in is the "LIFE OF THE CAPACITOR" under a multitude of operating conditions. We in the FAST organization have spared no expense to give you honest-to-goodness answers on this important factor in providing quality capacitors.

What follows is a summary of what we are doing to give you just that . . .



I: RESEARCH and DEVELOPMENT TESTS

AC and DC tests at various temperatures and voltages.

1—Investigation of Impregnants: (a) New impregnants AC—synthetic and natural oils. DC—oils, resins and waxes. (b) Studies of impurities and additives.

2—Investigation of electrode separators and electrode materials: (a) Modified kraft papers—low PF varieties and sundry densities. (b) Films—regenerated cellulose, polystyrene, teflon, "Mylar"*, Etc.

3—Number of groups tested: AC; over 800 involving more than 8000 units. DC; over 3300 involving more than 70,000 units.

4—Duration of tests: AC; many have been continuously under test for over 6 years. DC; many have been continuously under test for over 10 years.

5—Voltage range of tests: AC; 70 to 2400 volts at 60 and 400 cycles. DC; 140 to 44,000 volts.

6—Temperature range of tests: AC; Room to 130°C. DC; —55°C to +150°C.

II: PRODUCTION TESTS

A. Alternating Current

1—Heat runs on production lots—ultimate surface temperature rise.

2—Ultimate life hours of current production (periodic tests run).

B. Direct Current

1—Civilian Production: (a) ultimate life hours of capacitors taken from current production. (These test runs comprise over 1600 groups involving more than 16,000 units)

(b) Ultimate life hours of capacitors after being stored in cartons from 1 to 24 months under normal variations in humidity and temperature. (These test runs comprise over 230 groups involving more than 2300 units)

2—Military Production: (a) Test to applicable specifications (Jan. C-25; Jan. C-91; U. S. Army 71-1667; Etc.)

(b) These test runs comprise over 3300 groups involving more than 19,000 capacitors.

Please note Carefully: at least 80% of the 115,300 capacitors included in the above tests were tested to destruction at voltages from 1½ to 4 times rated and at maximum rated—or in excess of—operating temperatures. Many outside this group have not failed to date. Importantly too, this is a continuous policy of the company in sustaining our testing program throughout every day —year after year.

So with pardonable pride may we suggest QUALITY CAPACITORS is more than a "catchphrase" as applied to the FAST organization . . . and another link in the chain of GETTING TO THE BOTTOM OF THINGS?

* *Du Pont trade-mark for Polyester Film*

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Over A Third of A Century
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The 7-Range Clip-On Volt-Ammeter

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Offers These Important Advantages

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- Convenient ONE HAND operation trigger action.
- Thumb operated range selector switch.
- 7 ranges 5 current and 2 voltage.
- Insulated core shockproof construction.
- Takes cables up to 2¼" diameter.
- Distinct calibrations easy to read.
- Suitable for 50-70 cycles.

RANGES: 0-10 amps; 0-25 amps; 0-100 amps; 0-250 amps; 0-1000 amps; 0-150 volts; 0-600 volts

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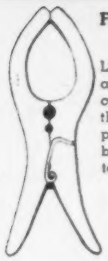
CHARCO
CLAMPS



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Linesmen all over the country are enthusiastic about Charco's new Bulldog clamps with the improved spring—rust proof, curved to eliminate breakage, positioned for more tension. Four styles:

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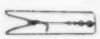
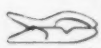
BLANKET CLAMP . . . curved open 3½" to grip line hose and rubber blanket.



WIRE CLAMP . . . graduated holes fit securely ahead of line hose, even on sloping wire.



FLAG CLAMP . . . special oval and notched jaws grip any flat, round, square or angled object up to 3" in diameter.

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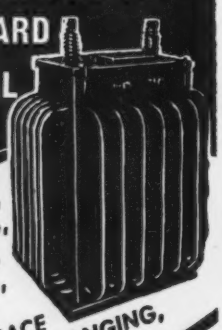

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UP TO 15,000 V.

SEND FOR NEW CATALOG NO. TR-50

CHAS. EISLER
EISLER ENGINEERING CO., Inc.
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its areas of operation, the Power District immediately offered to install street lighting under the same type of agreement entered into by the city with Public Service in 1951.

But the city feels it cannot make a deal with the Power District at risk of violating its agreement with Public Service.

Code Changes

National Fire Protection Association okays revisions in national electric requirements

Numerous changes in the National Electrical Code were given final approval at the annual convention of the National Fire Protection Association in Chicago last month. For the most part they recognized new developments in materials and electrical applications and experience gained since the last code changes.

Changes also were made in code requirements for emergency power supply to exit and other lights in theaters and meeting places and considered essential to the protection of life and property.

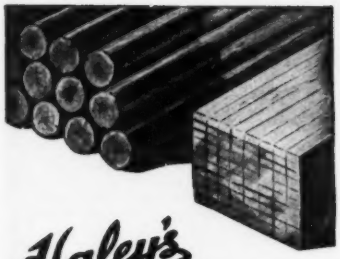
Mineral insulated-metal sheathed cable was approved for services, feeders, and branch circuits in both exposed and concealed work, in dry or wet locations, for under plaster extensions, and embedded in plaster finish on brick or other masonry. It was also approved for use where exposed to weather or continuous moisture.

Space Heating Requirements . . . Special attention was given to electrical space heating. A study is being made of demand factor. The new code limits surface temperatures to 150F, based on room temperature of 86F, where embedded elements and panels are used.

Panels and cables must be installed in their complete sizes or lengths as

Fluid Mapping Techniques Shown

Fluid mapping techniques for heat conduction in industrial electric heating were demonstrated by Prof. A. D. Moore, University of Michigan, at recent AIEE Electric Heating Conference held in Detroit. Techniques for converting fluid patterns into maps were developed by Professor Moore. Maps can be analyzed for numerical values by use of routine techniques involving only arithmetic and graphics. Determination of shape conductances, heat fluxes, uniformity of heat flux, isothermal lines, thermocouple locations, temperature at some point by means of thermocouples located elsewhere: these are problems often open to solution through use of fluid mapper techniques.



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No metal parts are used in the manufacture. This feature eliminates the danger of contact with live wires or current carrying equipment.

WRITE FOR BULLETIN A-83

IPCO Safety Equipment for all Industries
INDUSTRIAL PRODUCTS COMPANY
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supplied by the manufacturer. Units must bear labels or nameplates.

Wiring for space heating equipment, if installed in exterior walls, must be located outside the thermal insulation. In inside walls, wiring must be kept away from heated surfaces.

Embedded cables may be spliced only where necessary and by approved methods and the length of the cable must not be altered.

Heating panels must not extend beyond the room in which they originate. Cables may not be installed in closets or over cabinets which extend to the ceiling.

In the discussion of changes on emergency lighting requirements, E. A. Brand of Niagara Mohawk Power Corp, representing the Edison Electric Institute, expressed views of the utility sponsors of the code. Proposed changes dealt with such factors as where, when, and how much lighting and with required continuity of service. Brand was successful in obtaining rewording of the proposed changes, particularly as to continuity of service requirements, to make them more acceptable to utility sponsors of the code.

Receptacles . . . Another regulation controls the installation of receptacles to prevent plugging 115-v apparatus into 230-v receptacles, or 230-v apparatus into 115-v receptacles.

More rigid restrictions were placed on the grounding of portable appliances in other than residences. Grounding of ranges and clothes dryers to the neutral with No. 10 or larger wire is permitted.

Instrument transformer circuits need not be grounded where primaries of such instruments are connected to circuits of 750 v or less, the association decided. Previously this requirement was for 300 v or less. NFPA also ruled that open wiring may be used inside or outside of buildings, in dry or wet locations where the installation conforms to the appropriate code requirements, and that armored cable may be run or fished through air voids in masonry block or tile walls. The old code read "concrete masonry blocks." Water heaters, under the new rules, must have automatic temperature control.

Stricter requirements were adopted for wiring in areas where aluminum or magnesium dust conditions prevail or where such conditions may exist.

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THIEL
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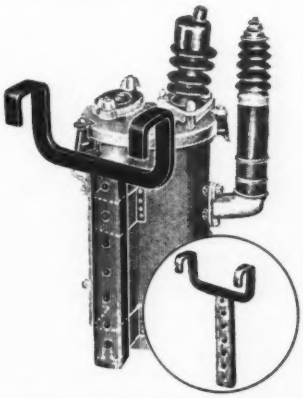
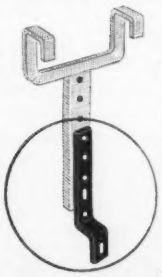
Formed from heavy gauge steel . . . hot-dip galvanized for longer life. Available in two sizes. Designed to meet NEMA specifications.



Model	1-Phase	3-Phase	Weight
T-1	3-15 KVA	9 KVA	16¼ lbs.
T-2	25-37-50 KVA	15-45 KVA	27¼ lbs.

HANGER KICKERS



Model K-1 for use with T-1 hanger. Adjusts to four positions. Model K-2 for use with T-2 hanger adjusts to five positions. Kickers and bolts are hot-dip galvanized.

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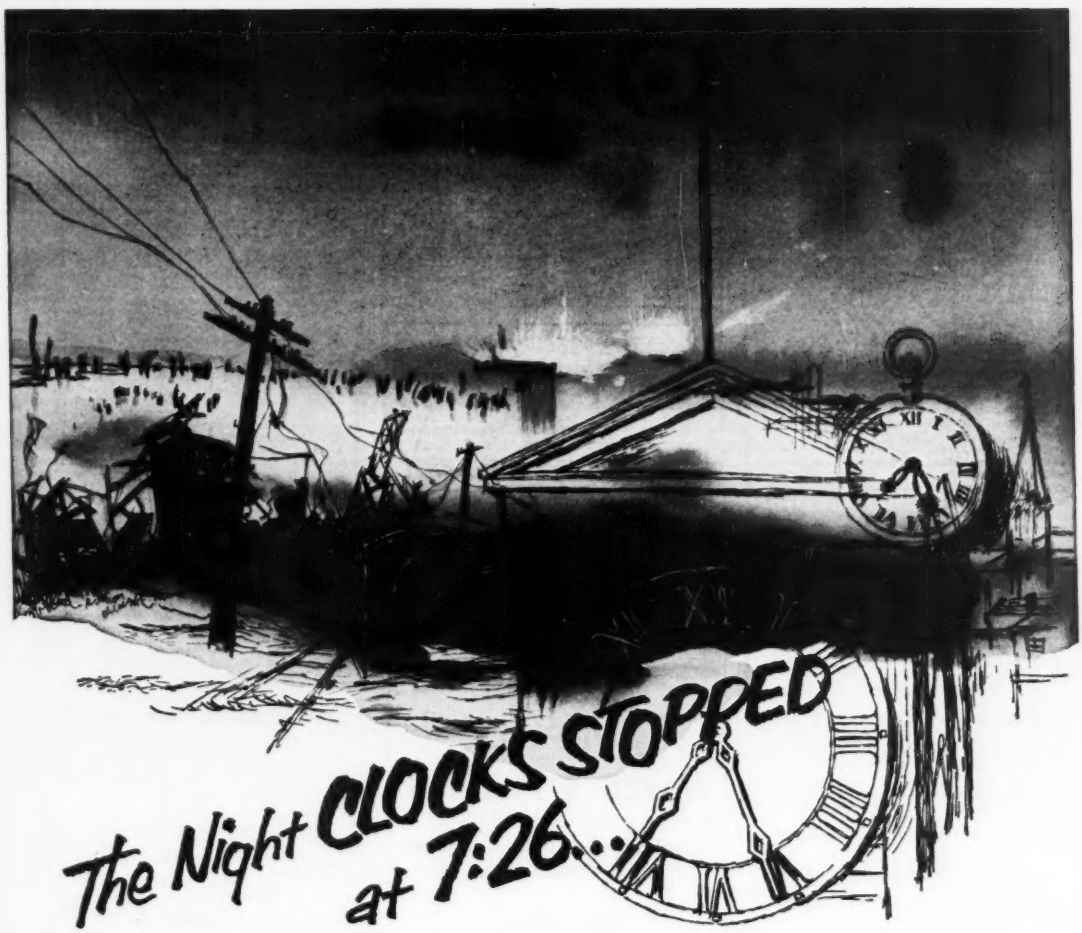

Some 9,500 people were in South Amboy, N.J., that drizzly evening in 1950. At the waterfront, longshoremen were transferring the last of 12 freight cars of ammunition to lighters that would carry it to a waiting vessel in Raritan Bay.

But the City Hall clock never got to 7:27—and the freighter's deadly cargo never got loaded. Explosions shattered windows over a radius of 12 miles; and hundreds of people looked at their arms and legs and saw that flying daggers of glass had stabbed them.

At dawn, 312 of the injured had been counted.

★ ★ ★

Such disasters have happened many times before in America. They could happen again. And *if* they do—and *when* they do—there must be blood plasma on hand to take care of the injured. For blood saves lives!

But blood cannot be mined or manufactured. It must come from the veins of healthy men and women. Men and women who feel concern for a suffering neighbor. So give blood—now!

Whether your blood goes for Civil Defense needs, to a combat area, or to a local hospital —this priceless, painless gift will some day save an American life!

Give Blood Now

CALL YOUR RED CROSS TODAY!

National Blood Program

Business Executives!

√Check These Questions!

If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

- ☐ Have you given your employees time off to make blood donations?
- ☐ Do you have a Blood Donor Honor Roll in your company?
- ☐ Have you set up a list of volunteers so that efficient plans can be made for scheduling donors?
- ☐ Have you arranged to have a Bloodmobile make regular visits?
- ☐ Has your management endorsed the local Blood Donor Program?
- ☐ Have you informed employees of your company's plan of co-operation?
- ☐ Was this information given through Plant Bulletin or House Magazine?
- ☐ Has your company given any recognition to donors?
- ☐ Have you conducted a Donor Pledge Campaign in your company?

Remember, as long as a *single* pint of blood may mean the difference between life and death for *any* American . . . the need for blood is *urgent!*

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Experienced public utility electrical design and distribution engineers required by an established consulting organization for work on continued program of plant expansion, distribution planning and betterment work for foreign public utility operating subsidiary companies. Location New York, possibly some foreign travel. Preferred age range 30-45. Attractive salaries. Excellent opportunities for qualified men. Write giving fullest details of qualifications and experience.

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The Israel Institute of Technology, Haifa, Israel, proposes to appoint 2 Professors of Electrical or Electronic and Telecommunication Engineering with special qualifications in Power Engineering; 1 Associate Professor in Electrical Power Engineering.

Applicants should have first-rate professional and academic qualifications, be willing to integrate themselves into the life of the country and, in due course, to teach in Hebrew.

Applications with full details should be sent, for transmission to Haifa, to:

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U. S. Government

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-3968) will be received at Denver, Colorado, until June 23, 1953, for furnishing six (6) single-bushing, wound-type, oil-immersed, single-phase, outdoor potential transformers, three of which are 92,000- to 65.71/115-volt (161,000-volt-insulated), and three are 138,000- to 69/115-volt (230,000-volt-insulated); and nine (9) single-bushing, wound-type, oil-immersed, single-phase, outdoor current transformers, six of which are 161,000-volt-insulated, 400/800- to 5-amperes, and three are 230,000-volt-insulated, 300/600- to 5 amperes, for Davis and Parker Switchyards, Davis Dam Project, Arizona-California. Delivery is desired within 300 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver, Colorado.

FRED G. AANDAHL, Assistant Secretary
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1000	West. (3-unit)	11000	137½/275
500	A.C.-Westgh.	2300	250
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400	A.C.	2300	120/240
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200	Ridgeway	220	250
150	G.E.	2300/440	250
150	G.E.	2300/4000	125/250
150	G.E.	440	275
100	G.E. (25 cy)	440	125
100	G.E.	2300	250
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60	A.C.	2300	110
60	G.E.	440	250
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600	*G.E.	TS7840	1.0	900
600	*G.E.	ATI	1.0	240
400	Westgh.	HQ	1.0	900
300	G.E.	ATI	.8	900
300	*G.E.	ATI	1.0	720
300	Ideal	SNS	1.0	257
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175	*Westgh.	HR	1.0	360
150	*Westgh.	HR	.8	900
125	G.E.	ATI	1.0	900
125	*Elo-Meh		1.0	900
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125	*G.E.	TS	1.0	277
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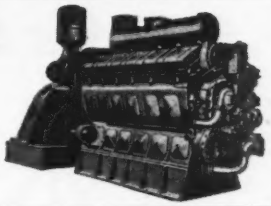

A PARTIAL LISTING OF OUR INVENTORY

KW	Make	Model	HP	RPM	KW	Make	Model	HP	RPM
1980	Nordberg	TS-217	2800	225	320	Enterprise	DSG-6	560	450
1500	Fairbanks Morse	33E16	2000	300	300	General Motors	8-268A	450	1200
1136	Fairbanks Morse	38D	1600	720	250	Fairbanks Morse	37-E	375	360
1100	General Motors	16-278A	1600	720	200	General Motors	8-268A	350	900
750	General Motors	12-567	1080	720	150	Worthington	CC-4	225	450
500	Baldwin	VO-8	750	514	150	Buckeye	80	240	600
500	General Motors	8-278A	750	720	100	Worthington	BB-5	150	600
500	General Motors	8-567	720	720	100	General Motors	3-268A	150	1200
400	Ingersoll-Rand	8-8	600	720	60	General Motors	6-71	90	1200
350	Baldwin	VO-6	510	450	30	Internat'l Harvester	UD-14	45	1200

A. G. SCHOONMAKER COMPANY, INC.
DIESEL DIVISION, 50 CHURCH ST., NEW YORK 7, N. Y.

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TURBO GENERATORS IN STOCK

Q.	KW	Make	Resc.
1—	1000	G.E.	Non-Cond—190 lbs-2400-3-60
1—	1000	Moore	Condensing—Extraction—190 lbs., 2400-3-60—Surface Cond.
1—	750	G.E.	Condensing—265 lbs., 440-3-60 Built 1944
1—	500	Moore	Non-Cond—150/200 lbs., 5/35 lbs. B.P., 480-3-60 Dir. Conn. Exciter
1—	400	Westgh.	Non-Cond—125/150 lbs., 5/10 lbs. B.P., 240/480-3-60
1—	300	G.E.	Non-Cond—150/175 lbs., 5/10 lbs. B.P., 480-3-60

FREQUENCY CHANGERS

Qu	Kva	Make	Cycles	Voltages
1—	12500	Whse.	25/60	13200 x 13200
1—	3750	G.E.	25/60	4150/2400 x 2400/4150
1—	3125	G.E.	25/60	4150/2400 x 2400/4150
2—	2500	G.E.	25/62½	2300 x 4160
1	1250	G.E.	25/58.3	4400 x 2300
1	625	A.C.	25/60	11000 x 2300

MOTOR GENERATOR SETS

3 ph, 60 cy.

Qu	KW	Make	Speed	DC Volts	AC Volts
1—	2000	G.E.	514	600	6600/13200
2—	2000	G.E.	500	666	25 cy. 11000
1—	1500	C.W.	514	115	4000/13800
1—	1500	G.E.	720	600	13200
1—	1500	G.E.	360	275	2200/4400
3—	1500	G.E.	514	250	6600/13200
1—	1500	G.E.	600	600	2300/4150
1—	1000	G.E.	900	260	4100/6900
2—	1000	Whse.	900	600	2300/4150
1—	750	Whse.	900	275	2300/4150
1—	500	Whse.	900	250	6609/13200
1—	500	Whse.	1200	125/250	2300
1—	500	Whse.	900	250	440
1—	500	G.E.	720	125	2300
1—	400	G.E.	720	250	440/2300

TRANSFORMERS—60 Cycle

KVA	Make	Type	Ph	Voltages
1—5000	Whse.	OISC	3	33000x26400/13200
1—2500	Whse.	OISC	3	26400/13200 x 480
3—1250	G.E.	HVDDJ	1	6600x550
1—1150	A.C.	OISC		13200x480/2400
3—1000	G.E.	HVDDJ	1	2200/480

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3— 500 KVA G-E 22000—2300/4000Y
3— 333 KVA W-H 6600—2300
5— 333 KVA Mol 7200/12470Y—2400/4160Y
3— 200 KVA G-E 22000—2300
3— 150 KVA G-E 44000—600/2400
3— 150 KVA G-E 19050/33000Y—2540/4000Y
2— 150 KVA G-E 6900—230/460
3— 100 KVA G-E 33000—6900/11950Y
3— 100 KVA G-E 13200—2300
3— 50 KVA A-Ch 33000—6900/11950Y
3— 50 KVA A-Ch 33000—2400/4160Y
3— 50 KVA A-Ch 13200—2300/4600

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2— 750 KVA G.E., 1 Ph., 4600V. 115/230
2— 400 KVA Pitts., 1 Ph., 2400/4800V. 240/48V.
3— 333 KVA Whse., 1 Ph., 2400V. 600 V. sec.
3— 300 KVA G.E., 1 Ph., 13200V. 220/440V.
1— 200 KVA G.E., 3 Ph., 2400-220 sec.

SYNCHRONOUS MOTORS
1— 300 H.P., Elec. Mach., 720 RPM. 3 Phase 60 cyc., 2200V T E F Cooled Outdoor service.
1— 150 H.P., G.E., 1800 RPM. 220V. 3/60.
2— 150 H.P., Al. Chal. 360 RPM, 440V. 3/60.

MOTOR GENERATOR SETS
1—1000 KW Whse., 600 V. 720 RPM, 4000 Syn.
1—1000 KW G.E., 800 V. 514 RPM, 4000 Syn.
1—1000 KW Whse., 275 V. 720 RPM, 4000 Syn.
1— 200 KW Whse., 250V., 900 RPM, 4000V. Syn.
1— 150 KW G.E., 126/250V, 1200 RPM, 2300 Syn.
1— 100 KW G.E., 250V. 900 RPM, 2300V. Syn.

SLIP RING MOTORS
1— 400 H.P., West., CW. 450 RPM, 550V.
1— 250 H.P., West., CW. 600 RPM, 440V.
1— 200 H.P., West., CW. 600 RPM, 440V.
3— 150 H.P., Al. Ch. 1800 RPM, 2300V., 3PH, 60 Cy.
1— 100 H.P., G.E., MT 600 RPM, 440V.

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AND, THERE'S ANOTHER SIDE TO THIS "COMPOSITE MAN," another complete news service which complements the editorial section of this magazine — the advertising pages. It's been said that in a business publication the editorial pages tell "how they do it"—"they" being all the industry's front line of innovators and improvers — and the advertising pages tell "with what." Each issue unfolds an industrial exposition before you—giving a ready panorama of up-to-date tools, materials, equipment.

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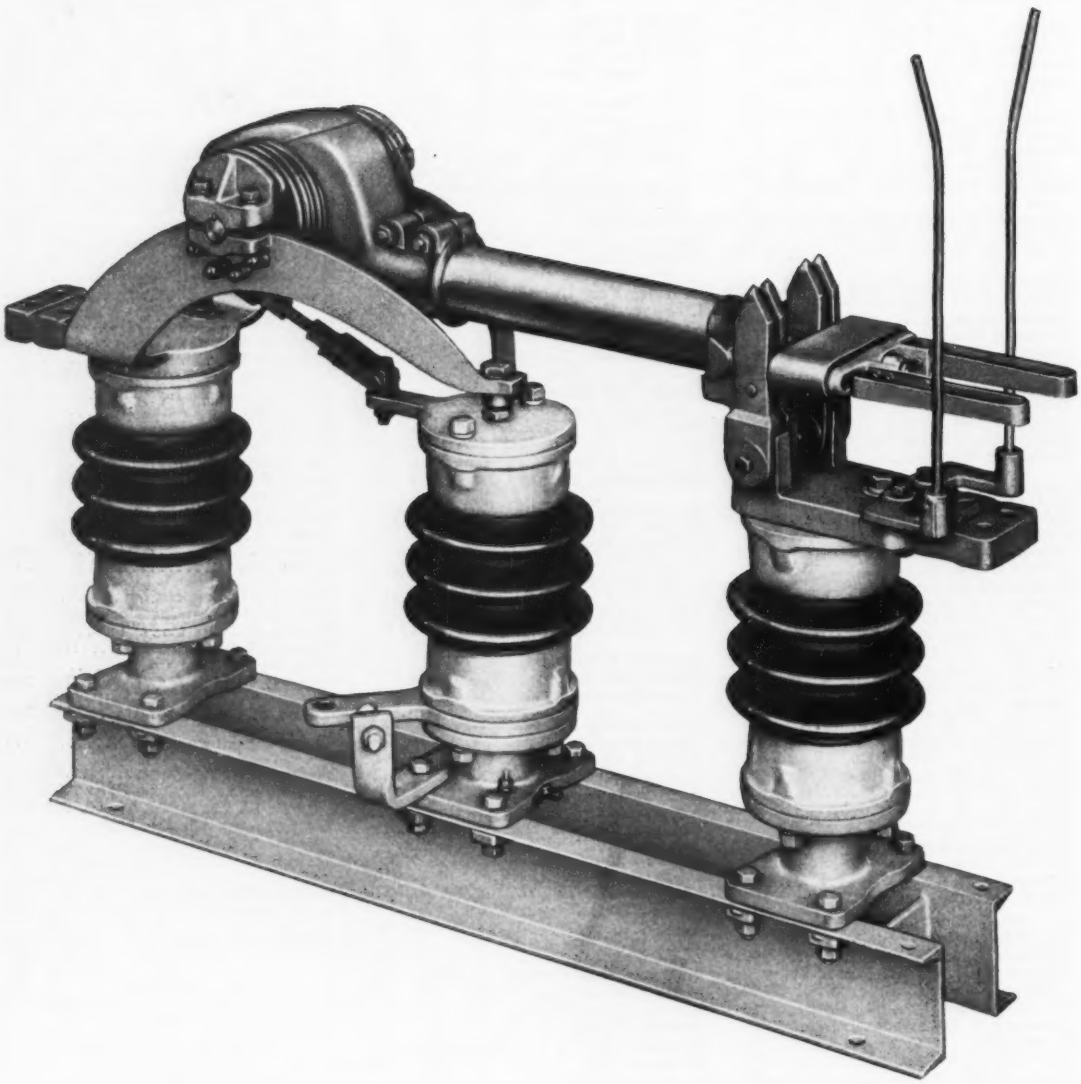
Cole Electric Co.

8439 Steller Drive | TExas 0-4701 | Culver City, Calif.



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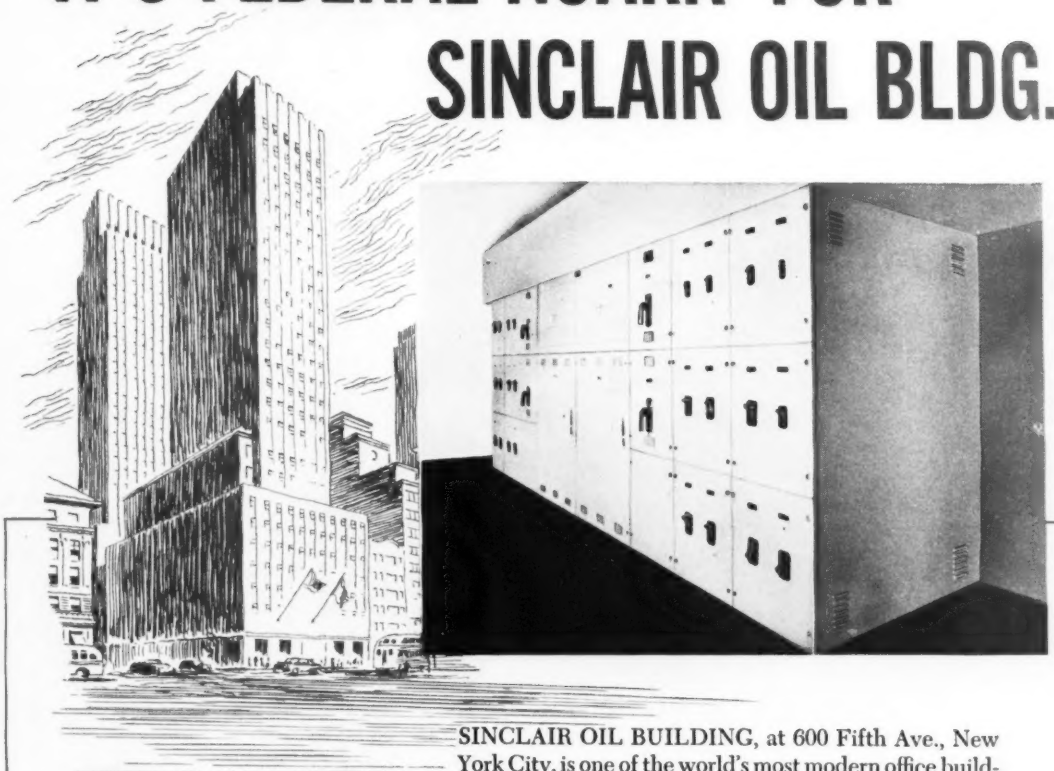

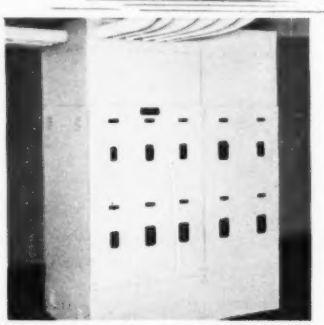

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OCT 19 1954

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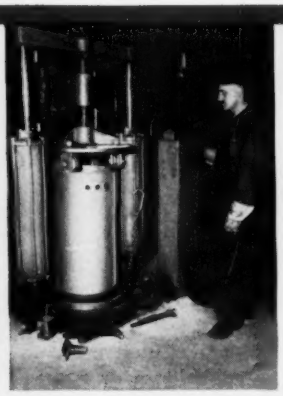
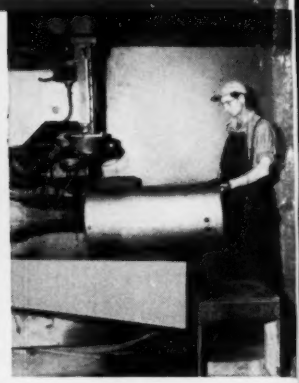
This is how *Kuhlman* makes distribution transformer tanks

1. All Kuhlman transformer tanks are made of heavy gauge copper bearing steel. Here a tank begins to take shape. The steel has been measured and cut and the necessary openings made. It is now being rolled into the shape of a cylinder.

2. After the metal has been shaped, the edges are brought together and electrically welded to form an oil tight seam.



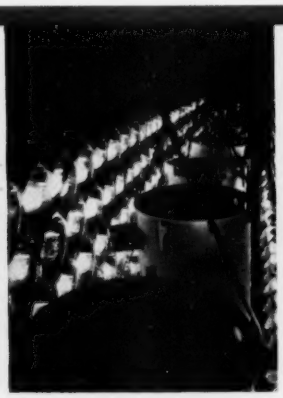
3. Next, the top end is "rolled down" to a smooth lip to form a suitable gasket seat.



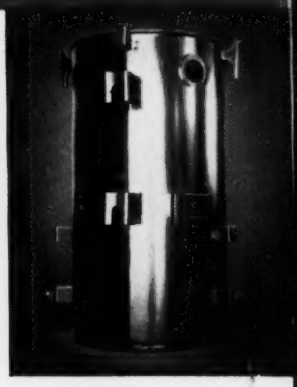
4. The next step is to attach the bottom. This is first "spotted" and then electrically welded all the way around to form an oil tight seal.

5. After the bottom end has been "rolled down" to form a smooth lip, the necessary accessories such as lifting ears, nameplate bracket, and mounting brackets are spot welded onto the tank as shown above.

6. Before they are painted the tanks are chemically cleaned and then shot blasted to assure a clean painting surface. Each tank receives a coat of rust inhibiting primer and two coats of corrosion resistant paint.



7. After each coat of paint the tanks are "baked" with infrared lights to insure a more durable finish.



8. And here is a completed tank, ready to receive its core and coil assembly and all necessary connections. Surfaces of Kuhlman tanks have successfully withstood 500 hours of salt spray and weatherometer tests.

Kuhlman transformers have been "on the line" for over half a century. Many of the earliest Kuhlman transformers are still in service—proof that Kuhlman builds rugged, highly efficient transformers. Specify Kuhlman. For more details about distribution transformers, ask for Bulletins CS-201 and CS-202.

Kuhlman **ELECTRIC COMPANY, BAY CITY, MICHIGAN**
CRYSTAL SPRINGS, MISSISSIPPI

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